IS SOUTHERN AFRICAN CUSTOM UNION AN OPTIMUM CURRENCY AREA?

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Abstract

The primary aim of this study was to investigate if SACU could be an optimum currency area and so to form a common currency on trade. SACU, as at the investigation of this study has shown, is already having a common monetary area. A progress has been made in realising macroeconomic convergence such as inflation stability within the region. The results also show that SACU economies are open. There is already a mutual trade in SACU and looking also at cultural ties within the member states, is also very high. This investigation is done in cognizance to the theory of optimum currency area (OCA).The cointegration results show long-run relation in the region. The ECM terms are negative and significant in all cases. Under GPPP the speed of adjustment has given rise to the conclusion that SACU countries can potentially constitute an OCA.

Keywords: Macroeconomic convergence, Optimum currency area, Gross Domestic Product, Inflation, exchange rates.

Declaration and copyright

I Thapelo S Rametsi, hereby declare that this research report is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not been previously in it’s entirely or in part submitted at any university in order to obtain academic qualification.

T.S. Rametsi Date:

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Dedication

This thesis is dedicated to my late mother, father and brother for their encouragement to continue studying.

Abbreviations

BLNS	Botswana, Lesotho, Namibia, Swaziland
CMA	Common Monetary Area
CPI	Consumer Price Index
CU	Custom Union
EAC	East Africa Community
EACB	East Africa Central Bank
EAMU	East Africa Monetary Union
EEMU	European Economic and Monetary Union
ECB	European Central Bank
EFTA	European Free Trade Association
EMS	European Monetary System
EMU	European Monetary Union
ERM	Exchange Rate Mechanism
EU	European Union
GDP	Gross Domestic Product
GPPP	General Purchasing Power Parity
IMF	International Monetary Fund
OCA	Optimum Currency Area
SACU	Southern African Custom Union
SADC	Southern African Development Community

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CHAPTER ONE

1.1 Background to the study

The study has been compiled with the aim of investigating if SACU is an optimum currency area. Zehirun (2015) explain generalized purchasing power parity as a recommended theory in assessing exchange rates in this study. Thus the hypothesis of Generalized Purchasing Power Parity (Generalized-PPP) is produced because of the failure of PPP. The Generalized PPP expresses that the two-sided genuine trade rates are, all in all, non-stationary since the genuine principal variables are by and large non-stationary. In the event that the genuine basic variables of a few nations offer basic patterns, these nations' genuine trade rates will have the same regular patterns. By sharing the normal patterns, these nations' genuine trade rates are cointegrated, and there exists no less than one stationary straight mix of the genuine trade rates. On the other side the traditional theory of optimum currency areas will be heavily drawn because it concentrates on the cost of forming a monetary union and the benefits but more importantly on optimum currency area for SACU.

SACU is one of the oldest existing custom unions and most effective example of economic integration in Africa (Mc'Gowan, *et al.*, 2007: 323). It was established in 1910 pursuant to a Customs Union Agreement between the then Union of South Africa and the High Commission Territories of Bechuanaland, Basutoland and Swaziland. With the start of independence for these territories, the agreement was updated and on 11 December 1969. It was re-launched as the SACU with the signing of an agreement between the Republic of South Africa, Botswana, Lesotho and Swaziland (SACU, 2010).

Its aim is to maintain the free interchange of goods between member countries. It provides for a common external tariff and a common excise tariff to this common customs area. All customs and excise collect in the common customs area are paid into South Africa's National Revenue Fund. The revenue is shared among members according to a revenue-sharing formula as described in the agreement. South Africa is the custodian of this pool (see appendix for formula of how the share is being calculated). Only the BLNS Member States' shares are calculated with

South Africa receiving the residual. SACU revenue constitutes a substantial share of the state revenue of the BLNS countries (Van Niekerk 2008).

The idea behind common currency is that two or more groups (usually countries) share a common currency. One of the man goals of forming a currency union is to synchronise and manage each country's monetary policy also referred to as a "monetary union". If SACU members decide to engage in common currency agreements with each other, then this could have potential effects on existing and potential trade agreements that each country has with each other and with countries outside the SACU group.

In this regard, it is imperative to exclusively dedicate this section to give the background to SACU if it can be an optimum currency area. It is for the above reason that the expose' will develop will use data from Reserve Banks of member states and World Bank and run a model developed in chapter 4 and 5. The findings of this research describes theoretical perspectives and previous research findings regarding the problem at hand (Leedy and Omrod 2010).

As suggested by Szeben K (2008), the theory of optimum currency areas states that the more two countries trade with each other, the better candidates they are for a currency union. In terms of the endogeneity argument, convergence follows from joining a currency union and the integration process itself turns the countries into optimal currency areas.

The potential increase in trade is regarded as one of the most important benefits of a currency union. Indirect evidence from studies on the effect of exchange rate volatility on trade does not support his claim. According to Rose as cited by Szeben K (2008), he argues that the common currency effect on trade is separate from the effect on the elimination of exchange rate variability and finds a large positive effect of a currency union on trade. Although his methodology has met with criticism, most studies find a positive estimate. A meta-analysis of the studies confirms that a common currency has a statistically and economically significant trade-creating effect. George S. and Tavlas G (2008), argues that with the 14 members of the SADC having set the objective of adopting a common currency for the year 2018, an expanding empirical literature has emerged evaluating the benefits and costs of a common-currency area in Southern Africa. In the study he reviews that literature, focusing on two categories of studies: (1) those that assume that a country's characteristics are invariant to the adoption of a common currency; and, (2) those that assume that a monetary union alters an economy's structure, resulting in trade creation and credibility gains. The literature review suggests that a relative-small group of countries, typically including South Africa, satisfies the criteria necessary for monetary unification. The literature also suggests that, in a monetary union comprised of all SADC countries and a regional central bank that sets monetary policy to reflect the average economic conditions (e.g., fiscal balances) in the region, the potential losses (i.e., higher inflation) from giving up an existing credible national central bank, a relevant consideration for South Africa, could outweigh any potential benefits of trade creation resulting from a common currency.

As already stated, the research methodology used is the systematic, theoretical analysis of the methods applied to a field of study, or the theoretical analysis of the body of methods and principles associated with a branch of knowledge. This study focuses mainly on the process used to collect information and data for the purpose of making decisions on the phenomenon of the study (Leedy & Omrod 2010)

The data analysis, used quantitative method, to check whether the results of the study converge and ultimately lead to the same conclusions. The data used in the study is reliable and credible. Annual time-series-data for a period of 10 years, starting from 2005 until 2014 has been used with special reference to understanding the pattern of movement with regard to Inflation and exchange rates in the NLBS countries.

1.2 Introduction

SACU, throughout its history, has been characterized by severe divergences in policies, levels of development, political systems, and administrative capacity. Notwithstanding those disparities it managed, through extremely fraught political circumstances, to maintain virtually free internal trade behind a high common external tariff, while allowing for large revenue payments to the smaller members. The primary aim of this study is to investigate if SACU could be an optimum currency area. This is to try to challenge the envisaged implementation of common currency on trade in Southern African Development Cooperation (SADC), to which studies have shown that she does not even meet the minimum criteria as an optimum currency area (Eita 2014). SACU, as at the investigation of this study has shown, is already a common monetary area. There is already a high labour mobility and given the gravity model, distance between the members is not a hindrance. The results show that SACU economies are open. There is again a mutual trade and cultural ties within the member states (Szeben 2004).

The unique political and economic objectives influenced the characteristics of the SACU. Indeed, those agreement reflected both the dominance of South Africa during its period of isolation, and the revenue concerns of the landlocked countries of Botswana, Lesotho and Swaziland (BLS) following their independence from the United Kingdom. South Africa accounts for more than 90 per cent of total SACU GDP and assumed absolute discretion over external trade policy.

This was acceptable for as long as the smaller member countries considered the customs union a vehicle for the collection and distribution of customs and excise revenues, and to a lesser extent for facilitating imports. Whilst the possible costs of the customs union were recognised, calls for reform were muted by the increasing magnitude of the revenue transfers.

The democratic transition in South Africa provided an opportunity to comprehensively re-negotiate the customs union. These negotiations re-opened long standing policy debates, including the extent of trade diversion in SACU and its impact on the development of the lesser-developed members. There was also some optimism that the changed political terrain might enable deeper economic cooperation and regional integration in SACU. But revenue issues remained of foremost concern, with all parties looking to stabilise future payments and receipts. Rapid changes within both the regional and multilateral environments posed new challenges for SACU that had to be reflected in the Agreement. These included the implementation of a free trade agreement within the SADC, the negotiations for a reciprocal trade agreement with the European Union (EU), ongoing WTO negotiations and plans to conclude an FTA between SACU and the USA (Szeben 2004).

In respect to the above, SACU over the years has undergone a lot of metamorphosis in terms of multilateral and bilateral engagements and political uncertainty in other member states, but fortunately all these upheavals did not pose serious instabilities of proportional magnitudes (Szeben 2004). It is on the basis of this that, this research is fascinated to investigate the feasibility of SACU if it can be an optimum currency area using the following statistical techniques: E-views and regression analysis.

1.3 Rationale

SACU, as an oldest union, has come a long way in various economic engagements and as such it is imperative for this region to look at the viability of being an optimum currency area.

In essence, in the formulation of economic agreements, priority should be given to Pareto Efficiency criterion that of making sure that no country will be left worse-off. If this criterion is not met, this engagement becomes a non-starter and as such currency union cannot be established.

Conventional cost-benefit analysis (CBA) techniques tend to allocate lower weight to the utilities of the poorer countries than to those of wealthier countries. This becomes a problem given the income distribution of the member countries of common currencies. Therefore, the policy prescriptions that results from the traditional CBA techniques may be regarded as politically impractical, or ethnically improper, or indeed, both (SABITA 2002).

While there is cumulative evidence to suggest the power and authority of cost-benefit analysis, neither it (CBA) nor any other tool for that matter, will inform us how to make trade-offs between the trading countries on common currencies. This is looking at revenue and capital acquiring. This sort of inquiry is fundamentally political in nature (SABITA 2002); it needs to be economically investigated. It is with such issues in mind that this research has been developed.

This study focuses on the prospects of optimum currency area focusing on the SACU members. As already mentioned above, SACU is one of the oldest existing customs unions in the world. It was established in 1910 pursuant to a Customs Union Agreement between the then Union of South Africa and the High Commission Territories of Bechuanaland, Basutoland and Swaziland. With the start of independence for these territories, the agreement was updated and on 11 December 1969. It was re-launched as the SACU with the signing of an agreement between the Republic of South Africa, Botswana, Lesotho and Swaziland.

Its aim is to maintain the free interchange of goods between member countries. It provides for a common external tariff and a common excise tariff to this common customs area. All customs and excise collected in the common customs area are paid into South Africa's National Revenue Fund. The revenue is shared among members according to a revenue-sharing formula as described in the agreement. South Africa is the custodian of this pool. Only the BLNS Member States' shares are calculated with South Africa receiving the residual. SACU revenue constitutes a substantial share of the state revenue of the BLNS countries.

The idea behind common currency is that two or more groups (usually countries) share a common currency. One of the man goals of forming a currency union is to synchronise and manage each country's monetary policy also referred to as a "monetary union". If SACU members decide to engage in common currency agreements with each other, then this could have potential effects on existing and potential trade agreements that each country has with each other and with countries outside the SACU group.

There are eight objectives of SACU and are summarised as thus:

- To facilitate the cross-border movement of goods between the territories of the member states;
- To create effective, transparent and democratic institutions which will ensure equitable trade benefits to member states;
- To promote conditions of fair competition in the common customs area;
- To substantially increase investment opportunities in the common customs area;
- To enhance the economic development, diversification, industrialisation and competitiveness of member states;

- To promote the integration of member states into the global economy through enhanced trade and investment;
- To facilitate the equitable sharing of revenue arising from customs, excise and additional duties levied by member states;
- To facilitate the development of common policies and strategies.

The Common Monetary Area (CMA) links South Africa, Lesotho and Swaziland into a currency union, in which the South African rand is the common currency. Namibia automatically became a member upon independence, but withdrew with the introduction of the Namibian dollar in 1993. However, Namibia has chosen not to pursue its own flexible exchange rate policy, and the Namibian dollar is at par with the South African rand and there is no immediate prospect of change. The same is true with the lilangeni of Swaziland and the loti of Lesotho. The rand continues to circulate freely in these countries, although it is strictly speaking not legal tender. Foreign exchange and monetary policy throughout the CMA continue to reflect the influence of the South African Reserve Bank. In addition the South African rand holds an approximate of 60% weighting based on the basket of currencies.

1.4 The research problem

One remarkable detachment facing Africa as a continent with regard to economic membership is the overlapping to various Regional Economic Communities (RECs) and a lack of investment in the institutions and systems required for integration (UNECA, 2010; Jovanovic, 2006). These impediments are not that of a hindrance towards SACU as the region is already a Common Monetary Area or the Rand Monetary Area.

The European Monetary Union comes into mind as the literature on this region has shown, therefore, this study is interested in investigating the feasibility of SACU of being an optimum currency area and so to form a common currency on trade. The analysis of political and financial aspects of the integration process is not the domain of this research and is left out of the process for a further future study.

1.5 Aims

The aim of this study is to explore if common currency in SACU can lead to economic growth, in terms of trade, labour mobility, and macroeconomic convergence such as inflation stability.

1.6 Objectives

The study endeavours to find out if SACU can be an optimum currency area. If this can be achieved based on the investigation in this study then it will be feasible for SACU to have a single currency.

The study must also assess the following

- Economic growth for member states
- Macroeconomic convergence
- Similarity of their inflation rates, and
- Labour mobility within the bloc as one of the requirements for an optimum currency area.

1.7 Hypothesis

This study investigates if the southern African custom union is an optimum currency area. In that case the following related hypotheses are examined:

H_0: SACU member countries might be potentially good candidates to form Optimum Currency Area.

H_1: SACU member countries might not be potentially good candidates to form Optimum Currency Area.

These hypotheses formulated above provide an inquisitive ground for the analysis that follows in subsequent chapters in this study.

1.8 Methodology and Data Sources

Different methodologies are used to answer questions posed in this thesis. The se methodologies are conceptual and empirical (quantitative).

1. Unit root test: This is used as it allows examining whether a time series is stationary or not.
2. Augmented Dick-fuller (ADF) test: To determine whether the variables follow a non-stationary and are in the fact of the order of 1, denoted as 1(1) or whether the series are stationary i.e. of the order of 0 denoted as 1(0).

3. Cointegration: To establish if there is any long-term relationship between variables.
4. Johannsen Approach to cointegration: This is a VAR and it is assumed that all variables are exogenous (possibility exists that they can be exogenous), and lastly
5. Generalized Purchasing Power Parity Model (GPPP): This will be used to test parity in real exchange rates in SACU members. This model is based on the law of one price and on the idea of the absence of trade barriers.

1.9 Justification of the study

High exchange rate could have implications for business and policy decisions and that is the reason why the movements of the exchange rate feature strongly in the debates around trade and trade policies (Mundell, 1961).

This research will mostly aim to benefit policy makers of emerging market economies by providing with up to date knowledge, new evidence and analysing the relationship among exchange rate and the performance of SACU countries. By presenting baseline information using the most recent statistics and econometric techniques, the study will also help analysts and academics by contributing to existing information on the topic and to provide a base for future research on related topics.

1.10 Organization of the study

This thesis is organised as follows. The first chapter gives an introduction, background, research problem, and hypothesis whilst chapter 2 provides theoretical literature review of optimum currency areas and benefits of common currency. Chapter 3 is the continuation of literature review of on monetary union of East Africa and the European experiences. Chapter 4 looks at research methodology used. Chapter 5 analyses the results and lastly, chapter 6 presents conclusions and recommendations based on the results/findings.

CHAPTER TWO

THEORETICAL LITERATURE REVIEW: OPTIMUM CURRENCY AREA

2.1. Introduction

The theory of optimum currency area (OCA) was first formulated by Robert Mundell in 1961 and has undergone a lot of metamorphosis over the years, most notably and extensively further developed by Bofinger (1994), Ishiyama (1975), Krugman (1992), De Gauwe (2003), Masson and Taylor (1992), Tavlas (1993a, 1993b, 1994), Mongelli (2002) Mckinnon (1963) and Tower and Willet (1976).

In its original format, Mundell (1961: 657) defines OCA as "the domain within which the exchange rates are fixed". But the fact of the matter is that in a modern economy the exchange rate are not fixed but rather allowed to fluctuate and the mechanisms of demand and supply will determine the exchange on international money markets.

The theory of OCA is regarded as a precursor for the adoption of a common currency on trade and as such led to the factors that should be taken into consideration in pursuant to this adoption, namely; the benefits and costs of adopting a common currency on trade and the criteria for such adoption.

Table 2.1: Taxonomy of Economic Integration

Taxonomy of Economic Integration	Characteristics
Free Trade Area	• An agreement among countries about the elimination of all tariff and quantitative restriction on mutual trading
Custom Union	• Free trade are added to the common external tariff
Common Market and Economic Union	• Free movement of factors of production, goods and services with harmonized or coordinated national policies and transfer to the supranational level

Monetary and Fiscal Union	• To implement single currency and operate under single central bank with tax harmonization and fiscal sovereignty
Political integration or Political Union	• Effective and democratic body at the supranational level

Source: Adapted from Zerihun (2014)

According to McKinnon (1963), trade factors are imperative and play an important role to the theory of OCA, given they have a profound significance in the country's trade behavior. To this end, these are the cog of determining optimality.

'if we move across the spectrum from close to open economies, flexible exchange rates become both less effective as a control device for external balance and more damaging to the internal price-level stability'(McKinnon, 1963).

Optimality is referring to factors of production such as labour being one of the criteria for OCA to be realised. This criterion is being discussed extensively under 2.4.1. There are so many challenges to this theory (OCA) but despite all the critiques, it has laid a solid foundation for further studies and researches.

The rational expectation in OCA analysis of monetary unions is based on Lucas critique that provides an important lesson to SACU which states that:

It is appropriate to estimate econometric models of the economy, in which endogenous variables appear as unrestricted functions of predetermined variables, if one proposes to use such models for the purpose of evaluating alternative economic policy regimes (Lucas, 1976).

This critique is accepted by some studies as being relevant as is limited to practice (Estrella & Fuhrer, 2003; Rudebusch, 2005). They studies suggest that tests for parameter stability in backward-looking specifications or reduced forms of macroeconomic relationships typically fail to reject the null hypothesis. For the purpose of this study, the Lucas critique does not give any relevance and this gives an opening to the future research for SACU to fill the gap.

2.2 Benefits for the adoption of a single currency

According to De Grauwe (2003:60), it is difficult to come up with a well-worked conclusion that there are clear-cut benefits of adopting a single currency but concedes that in the ultimate, there are some benefits to be realised. The example is the factors of production previously involved in those activities now become available for alternative uses (Ricci 2008:2).

2.2.1 The elimination of transaction costs

The regional blocs that adopt a single currency have the advantage of eliminating the *deadweight loss* due currency transactions and to the need to collect and process information (De Grauwe 2003:61). This is evidenced by a better performance in fulfilling the transaction motive for holding money in liquid assets for day to day transactions, that is; money as a medium of exchange and unit of account (Ricci 1997:9).

2.1.2 The elimination of relative price and exchange rate uncertainty

In adopting a single currency there are efficiency gains emanating from relative price distortions brought about by the costs of transactions (Mongelli 2002:8) and the reduction of exchange rate uncertainty. This is benefit is the catalyst and of utmost in the adoption of a common or single currency but most unfortunately difficult to quantify (Visser 2000:159). One important aspect to this effect is that investors who in most cases influence the money markets as speculators are discouraged (Tavlas 1993:668).

2.1.3 Cost benefits and consequences

Since this session is subtitled An Academic View, I will begin with the three standard textbook advantages of a monetary union. Currency convenience. A traveler in the Eurozone does not have to carry a different currency for each county that he will visit. This is an advantage to potential joiners, to the receiving group, and to outsiders. The importance of this is not large in today world of credit cards and ATMs.

Price comparability. With a single currency, a shopper in one country can easily compare the price of a particular good in different places, thereby minimizing the cost of purchase and strengthening the efficiency of the market. This too is a potential gain both to the joiner and to the existing group. But I have never understood why this is considered significant. The housewife in Madrid cannot shop for her daily bread in Frankfurt while the wholesale buyer has always been able to compare the prices of steel that were stated in Spanish pesetas and German marks with the help of a pocket calculator.

Cross border investment. A single currency eliminates the direct exchange rate risk of cross-border investment within the currency union. This also is a potential gain to both the joiner and the existing group. Each can invest in the other without worrying about the potential loss if the exchange rate changes adversely. To the extent that this causes cross-border investment to occur that would not otherwise have happened, it presumably increases the efficiency of the international allocation of capital. But the amount of this gain is reduced to the extent that firms would otherwise hedge that currency risk by borrowing in the host country to finance their cross-border fixed investment and would use currency futures to hedge the currency risk of cross-border portfolio investment. The academic literature on monetary unions focuses on the continuing advantages and disadvantages of membership. In practice the creation of the European Monetary Union demonstrated that there can be significant transition gains for some of the joining countries. Before, joining the EMU, several countries had high inflation rates and correspondingly high rates of interest. The requirement to reduce inflation and interest rates as conditions of membership gave these countries the political ability to make these healthy changes. Once in the EMU, the lack of independent national monetary policies preserved the low inflation. The EMU membership criteria imposed on those who would join the EMU also included a reduction in the fiscal deficit and in the national debt.

Although, not all applicants satisfied these standards at the time of entry, their attempts to do so did initially help to reduce government spending and to limit fiscal deficits. Lastly, there will be no inflationary pressure in the adopting area (bloc) of a single currency and as such the need for reserve banks for holding foreign reserves is eliminated. The reserves are brought together and invested for a better return for future use when a need arises (Visser 2000:159).

The currency union implies a single monetary policy and a single exchange rate for all member countries. A country that joins a currency union therefore gives up the opportunity to select a monetary policy that it regards as optimal for its own circumstances. Similarly, the country's exchange rate cannot respond to the market forces by which changes in technology, taste, and the behavior of other countries affect its international competitiveness.

A country that considers joining a currency union must weigh these disadvantages against the advantages that I have described in the earlier part of these remarks. This balancing will differ from country to country. Each country must consider the extent to which it can expect to gain from those advantages and the extent to which it would be disadvantaged by the single monetary policy and single exchange rate.

The adverse effect of the single monetary policy and single exchange rate will depend primarily on four conditions.

Industrial similarity. If all of the countries in the currency union had the same industrial composition and were subject to the same shocks to technology and demand, the lack of individualized monetary policy and differential exchange rate movements would be irrelevant. A country that considers joining should evaluate the extent to which a monetary policy designed for the currency union as a whole would be the best one for itself. We see in the EMU substantial differences among countries in the distribution of industries that are reflected in differences in unemployment rates and in trade balances.

Labour Mobility. A fall in demand in a particular country or region will lead to less unemployment if the labor force is geographically mobile and can shift to other areas where demand is stronger. This is one way in which the United States has been able to cope with cyclical and structural changes in demand. The ability to achieve such labor mobility in a currency union depends on several features. The variety of languages clearly inhibits labor mobility within the euro area. Labor regulations, union restrictions, and licensing rules may also impede such geographic mobility.

Fiscal Structure: Fiscal policy is important in two ways: the role of the central fiscal authority and the freedom of the individual national fiscal authorities. In the United States, the central government collects about two thirds of all taxes and an even larger part of cyclically sensitive income and profits taxes. When demand falls in a particular part of the country, the amount of taxes paid from that region to the central government falls. This automatic fiscal policy dampens the local decline in net income and therefore stimulates demand relative to what it would otherwise be. That helps to compensate for the lack of an independent monetary authority for the region. In a currency union with a very small central fiscal authority, like the EMU, there is no such fiscal counterbalance to local swings in domestic demand.

Members of the currency union can of course vary national taxes and spending to provide a local stimulus to offset declines in demand. But this ability to run deficits creates a problem for the currency union as a whole. Because there is a single currency, large fiscal deficits in any single country do not create the market feedback in the form of higher interest rates or a weaker currency as it would if the deficit country had its own currency. Although there are some relatively small differences in national interest rates, the primary effect of any countrys fiscal deficit is diluted and spread over the entire currency union, causing the common interest rate to rise and the overall currency to decline.

While this is an advantage for the country that alters its domestic policy, it is a disadvantage for the currency union as a whole. That led to the Stability and Growth Pact that, in principle, limits the extent of any country fiscal deficit. Some rule of that type is a necessary feature of any currency union in which fiscal actions remain decentralized among the member governments. That limit on each country's fiscal policy is a further disadvantage for countries that consider joining a currency union.

Willingness to Sacrifice. The potential success of a currency union depends on the willingness of the member countries to accept what the monetary authority regards to be best for the group of countries as a whole. At times, that will mean a policy that is directly counter to the interest of specific countries within the currency union. The willingness of those countries and of their voting publics to support a common policy that is clearly against their interest is a critical feature that will govern the long-term success and survival of any currency union.

Lastly, there will be no inflationary pressure in the adopting area (bloc) of a single currency and as such the need for reserve banks for holding foreign reserves is eliminated. The reserves are brought together and invested for a better return for future use when a need arises (Visser 2000:159).

2.3 The costs of adopting a single currency

Similarly, as much as there are benefits, and so are costs for adopting a single currency. It is on the basis of this that it is of paramount importance for the adopting countries to do an introspection to look at the costs when indulging in the adoption of a single currency. To this end, the exchange rate policy plays a crucial role in this regard.

2.3.1 The costs of fixed exchange rate area

Despite the fact that one of the criteria of having a common currency is low inflation rate of the adopting countries, there costs involved in the exchange rate area. A country that joins an exchange rate area gives up its ability to use the exchange rate and monetary policy for stabilising employment and output Krugman & Obstfeld (2006:560). This is known as economic stability loss due to the country by joining the economic bloc/integration with its exchange rate partners.

The exchange rate is fixed within the member states and as such it is difficult for purposeful stabilisation because monetary policy has no power to affect domestic output and to reduce the rate of unemployment (De Grauwe 2003:54). Greater integration leads to shallower slump and a costly adjustment.

2.3.2 Loss of seignorage

A country that joins a common currency area must brace itself with the fact that she is going to lose her seignorage. This is a revenue a government gets when the central bank issues new notes (money) when financing its financial obligations (Krugman & Obstfeld 2006:557). Unfortunately this increases inflation and as such, it is not that important as a cost factor in the adoption of a single currency.

2.3.3 The costs of converting to the new currency

Once a new currency has been adopted, the old currency of those of member states should be discarded. This becomes a burden of conversion that will include costs to the inhabitants and business people. It becomes cumbersome in determining the cost to the banks and other related cash dispensaries that need to be updated with the new currency. (Visser 2000:183).

The advantages of a common currency are obvious, if hard to quantify: reduced transaction costs, elimination of currency risk, greater transparency and possibly greater competition because prices are easier to compare. Before the creation of the euro, some statistical work on the limited number of country pairs sharing a currency suggested that the common European currency might produce an explosion in intra-European trade; that hasn't happened, but trade does seem to have risen modestly as a result of the single currency, and presumably that corresponds to an increase in mutually beneficial and hence productive exchanges.

The disadvantages of a single currency come from loss of flexibility. It's not just that a currency area is limited to a one-size-fits-all monetary policy; even more important is the loss of a mechanism for adjustment. For it seemed to the creators of OCA, and continues to seem now, that changes in relative prices and wages are much more easily made via currency depreciation than by renegotiating individual contracts. Iceland achieved a 25 percent fall in wages relative to the European core in one fell swoop, via a fall in the krona. Spain probably needs a comparable adjustment, but that adjustment, if it can happen at all, will require years of grinding wage deflation in the face of high unemployment.

2.4 The criteria for optimum currency area

As already defined that optimum currency area refers to a group of countries with economies closely linked by trades in the goods and services and by factor mobility. A fixed exchange rate will serve the economic interest of each of its members within the bloc "if the degree of output and factor trade among the included economies is high" (Krugman & Obstfeld 2006:564).

2.4.1 Labour force mobility

This is the most important criterion for a regional bloc to be regarded as an optimum currency area. This factor of production (labour) should be mobile within the member states. Border controls should be eliminated, that is; free movement of labour but in most cases language and culture become a stumbling block for labour mobility (Krugman & Obstfeld 2006:547). **(In the case of SACU to which this research is all about, this is no hindrance).**

2.4.2 Wage and price flexibility

It is prudential that there must be wage and price flexibility for an optimum currency area to be realised in the adopting countries. But most unfortunately is somehow difficult in the sense that prices will not always be flexible and as such the wages will not be the same. The goods and the services market have in most cases to an alarming extent have diminished the wages and prices are flexible (Fleming 1971:471).

2.4.3 Openness of the economy

If the economy is open, according to McKinnon (1963), there will be a coercive tendency towards the adoption of a fixed exchange rate (this is relevant with regard to Mundell's (1963) definition of common currency area).

A monetary union can only be realised if the exchange rate is fixed within the member states and for this reason openness of the economy becomes a pre-requisite for an area to be regarded as an optimum currency area. The floating exchange rate is eliminated and replaced by the fixed rate that will not allow a room for fluctuations. A fertile ground is made available for smaller countries not to resist to join the bloc as their economies will now be opened.

2.4.4 Diversification of the Economy

According to Kenen (1969) if the economy is well-diversified, it will avoid suffering from country specific shock. The product to be traded should be diverse within the area as it will stabilise capital formation (investment) and in so doing "serves to average out external shocks" (Kenen 1969:13). In repudiating Mundell's approach to OCA based on perfect labour mobility criteria, Kenen propounds that such mobility rarely prevails in reality.

Based on the above expose of Kenen, it is paramount that a well-diversified economy does not have to undergo changes to its terms of trade. It is for this reason that a country if her products are diverse, she can export the alternative and in so doing compensates fully for growth and the reduction of unemployment. The ultimate goal is economic stability. A decline in the export of one good is off-set by the export of another good. To epitomise, the bloc whose production patterns are diverse and have identical export structures can form an optimum currency area.

2.4.5 Similarity of inflation rates

The countries that are to be part of the union must in all possibilities to have similar inflation rates. It will be very disturbing if this criteria is not met if say one member is having a galloping inflation, optimum currency area will not be realised. Inflation is defined as the general increase in prices (when little goods are being chased by more money).

Fleming (1971:476) is of the opinion that the member countries should have more or less same inflation rates to maintain fixed exchange rates, if not, it will be highly unlikely that OCA will be realised – this will be just a pipe dream.

Tavlas (1993:673) says that similarity in inflation rates is not a precondition but rather a desirable and attractive outcome. The problem with inflation is that it can be manipulated using policies such as inflation targeting.

2.4.6 Other criteria

The similarity of the economic structure of the member states is important for OCA. The extensive trade within the member states must be easier for the member to adjust to output market disturbances that affect it and its currency partners differently (Krugman & Obstfeld 2006: 566). The most unfortunate part is that it does not tell what factors will reduce the frequency and the size of member-specific product market shocks (*Ibid*: 566).

Another criteria is fiscal federalism as propounded by Krugman and Obstfeld 2006 in the members' ability to transfer economic resources from members with healthy economies to those suffering economic setbacks. If one member state can perform poorly, other members within the bloc should come to her rescue and receive support. Such federalism can help offset the economic stability loss due to fixed exchange rates.

2.5. Trade agreement and tariffs of SACU members

Krueger (1997) emphasises that there is no tariffs that should be changed against the member of SACU and the free trade movement of goods and services in BLNS regions. He also elaborate the importance of charging external tariffs to none SACU members, for example EU, UK and USA.

Maasdorp (1992), when countries enter into a free trade agreement, changes in trade flows arise due to changed conditions of competition, and he further classified these processes as trade creation and trade diversion. In his classical consideration, when a developing country enters into an FTA with an industrialised country, trade diversion effects are likely to dominate in the third countries due to complementary production and trade structures.

Margaret (2003), another study on free trade agreement (FTA) was undertaken where he investigated the impact the agreement had on the RSA's trade with Southern Africa and the rest of the world. He used trade statistics for the periods 1999 – 2004 between the RSA and its trading partners to symbolise trade before and after the implementation of the agreement.

Hansohnm (2006), argued that when considering bilateral trade, import and export prices are not available on bilateral basis to be included in export and import demand functions. This is an important issue due to the fact that a country exports and imports of different commodities are to different trading partners.

Ngwenya (2002:26), SADC in turn, is envisaged together and after consolidation with other continental integration arrangements, notably the Common Market for Eastern and Southern Africa (COMESA), to play an important role in the development of the recently formed African Union.

2.6. Formal models of optimum currency areas

Models on optimum currency areas were rekindled after the failure of The Asian Tiger economy between 1997-98, known as ASEAN Plus Three (APT). Bayoumi (1994) expatiated on the work of Nobel laureate Robert Mundell theory of OCA. He (Bayoumi) concentrated on structural VAR technique. This technique consists of running a national VAR of changes of output and prices to identify the coefficients of the structural form (Lee & Azali). The model of Bayoumi gives an insight into the welfare effect on currency unions and as such concluded that the countries that are part of the union their welfares are relatively improved – this is another fact for a further research to prove and/or disapprove. But Bayoumi qualifies it by saying that this can also impact on the lowering of welfares for the rest of the world (Bayoumi 1994:552).

Ricci (1997) came with the idea of real and monetary aspects and related them to two country model in investigating the benefits of participating in a currency area. The results were very profound in the sense that the net benefits that a country expects from monetary integration increase with the correlation of real shocks between the two countries, since the exchange rate becomes less useful as an instrument of adjustment. His is in relation to the degree of openness of the economy.

Mckinnon (1963) emphasis was on the openness of the economy as a precondition of qualifying as an OCA. He maintains that the more open the economy the better the chance the countries fit to create a common currency. The ratio of tradability and non-tradability of goods is a good judgement of openness of an economy whereby the ration is a good concept that classifies tradable goods as those that can enter into foreign trade, while non-tradable goods cannot enter into foreign trade because of factors such as high transportation costs (Kundera 2013). Thus the exchange of goods over the borders between countries is indicative of the degree of openness of a national economy.

The postulate of Mckinnon have been further developed by various economists as they envisaged the idea of openness as the share of economic activity devoted to international trade. Exports (X) and imports (Z) ratio embedded in Gross Domestic Product (GDP) becomes a good yardstick or panacea of openness to the trading partners. Thus:

$$Xa \qquad \frac{X + Z}{P}$$

In this regard, an open economy has high participation of exports and imports in the total production of goods ands and services. If X>Z in country A than in country B, it goes without say that country A is becoming more open than country B. This can be seen as a measure or degree of integration (*Ibid)*. Kenen's (1967:41-60) eclectic view of the optimum currency area epitomises it by saying “diversification in production and exchange serves to average out external shocks and to stabilise domestic capital formation”.

2.7. The Significance of GPPP in OCA Theory.

The theories of OCA as developed by Mundell, 1961; Mckinnon, 1963; Kenen, 1969; and Ingram, 1973 are well documented as is common knowledge that the traditional OAC theory states that the requirements for suitable monetary unions are the *symmetry of shocks, the mobility of factors, the diversion of factors of production, the similarity of inflation rates, the flexibility of wages and prices and the capacity of risk sharing* (Tabsoba, 2009). It is for this reason that there is no need to further elaborate on them, instead concentration will now be on generalised purchasing power parity model (GPPP) in exploring its significance to OCA.

GPPP postulates that the real exchange rates between two countries comprising the domain of a currency area should be co-integrated. GPPP is also significant in the multi-country set-up. GPPP is based on the law of one price which refers to the fact that the exchange rates should equalise the national price levels of different countries in terms of common currency (Taylor, 2003). In accordance with this notion; any exchange in relation to national price levels between two countries should lead to a corresponding adjustment in their bilateral nominal exchange rate. Any variation to this effect will lead to a deviation from GPPP.

The most important and significant analogy is the testing of stationarity in real exchange rates and this will in turn result into an empirical support for GPPP (Taylor *et al.*, 2001). In the case of this study, three variables, that is; inflation, GDP and exchange rates, are going to be tested using various models and if need be; error correction model will be applied.

2.8. Conclusion

Various authors and scholars have attacked Mundell theory on optimum currency areas and most notably was Kenen in “eclectic view of the optimum currency area” (2012). In this article, he refutes the criteria of fixed exchange rate and thinks that the best criteria for OCA is product diversification as the most important. Needless to say that despite Mundell having delivered a paper at the Tel-Aviv University in December 5, 1997 to clarify his theory, he (Kenen) is still skeptical.

In essence, the theory of optimum currency area has been studied extensively and have given the researchers a basis for further research – a useful tool not a recipe. This theory has given us some positive essential elements as pre-conditions for the successful implementation of common currency: labour mobility, product diversification, same inflation and openness of the economy.

In it one can across the problems of culture and language that hinder (partly) the creation of a common currency.

The main cost of joining a currency union is the loss of monetary policy independence, with the consequent inability to react to shocks through exchange rate adjustments. Quantitatively assessing this loss, however, is an extremely difficult task, as there are many factors affecting the need and effectiveness of monetary policy as an adjustment instrument.

The cost of monetary union according to the optimum currency area is the loss of independence in performing monetary policy at the national scope. The loss of monetary policy independence means that a country is no longer able to use monetary policy in order to mitigate the effect of asymmetrical shocks that might hit the country in question. The extent of whether the cost is high or low depends on how the country performed its monetary policy prior to joining the monetary union. In a country where the monetary policy was never conducted optimally, for example in developing countries with underdeveloped capital market and weak central banking institutions, the loss of monetary policy independence is suggested to be lower than in countries with a history of optimally conducted monetary policy.

Besides the cost, monetary union will have major benefit for the countries within the union as it increases the trade level in both goods and services and also facilitates the investment among the countries that participate in the union via the reduction of transaction costs and exchange rate uncertainty. The greater integration in trade and financial market will in turn result in a more synchronised business cycle, thus in a lower probability of symmetric shocks. This leads to the argument that some optimum currency area criteria such as trade openness and correlation of economic shocks are in fact endogenous and will increase as countries join the monetary union. Further, monetary union will also enhance the policy discipline and credibility of the respective countries as well as improve the exchange rate regime and allow monetary mechanism to perform effectively.

CHAPTER THREE

ECONOMIC INTEGRATION INITIATIVES: LESSONS FROM AFRICA AND BEYOND

3.1 Introduction

The independence of African states brought some interests in regional economic integration based on regions and the creation of a pan-African common market has been a central vision of African leaders. The advent of African Union is a precursor to the formation of African Economic Community (AEC), on June 3, 1991. Having created (AEC), a call was made for an African Central Bank (ACB) to follow by 2028 with a single currency to be established by 2023.

One remarkable feature and aim is to bring economic stability, peace and security by forging a strong unity within African Union (AU). The most unfortunate part of it is that Africa is becoming highly marginalised by globalisation (Adepoju, 2001) and member states see only one way of going out of the above mishaps by looking at integration as a bargaining tool by achieving a common negotiating position.

3.2 East Africa Experience

The East Africa Community (EAC) was formed in June 2001. It consists of Kenya, Uganda, Tanzania, Burundi and Rwanda. This economic bloc has gained momentum in recent years. To this end, one major aim is to have a single currency this year, 2015 based on various meetings undertaken over the years. As at the writing of this research, concrete evidence of this idea to be implemented is still in the pipe-line.

This is an intergovernmental organisation based on geopolitical confederation with the headquarters in Arusha, Tanzania. Burundi and Rwanda are late joiners in November 2006 (Guardian, 2006) and the ceremony for acceptance was held on 18 June 2007 (Cocks, 2007).

3.3 East Africa Regional Integration: British Vision

East Africa Federation (EAF) is the precursor to East Africa Community (EAC). The initial members were Kenya, Uganda and Tanzania, this is a revival of the old East Africa Cooperation with its demise in 1997 that ultimately revolved to be EAC. Colonialism propagated by Britain in the 1890s had three major objectives and are as thus:

- To secure the control of the Nile headwaters as a conduit to protect Egyptian interest and position in the Suez Canal
- To monitor pre-World War 1 era German imperialism in the region, and
- To make Kenya a viable farming region by establishing rail transport.

The East Arica region as was colonised by Britain at time consisted of Tanganyika (read: Tanzania), Uganda, Kenya and Zanzibar (an island coast of Tanzania). Britain established in 1948 East African High Commission (EAHC) to oversee a variety of common service initiatives such the establishment of a regional university (namely, the University of East Africa), airways, railways, unions (custom and postal), departments such as telepragh and meteorology and harbours.

In 1961 East African Common Services Organisation (EASCO) was established and unfortunately was deemed to be politically unacceptable due to the fact that Tanganyika (Tanzania) had attained independence from Britain in the same year. In the years to follow all the member gained independence and as such a new direction was followed based on African direction in engaging for the continuance of the common services initiatives (Kamanga, 2004).

3.4 Macroeconomic shock synchronisation in EAC

In the rest of Africa regional integration has moved rapidly due to the political will and increased resource's flows for regional projects under the Extended Integrated Framework and the Aid-for-Trade initiatives. In 2005, this momentum of integration went further ahead in EAC after having stagnated and the member states established closer economic links through a Free Trade Area (2001), a Customs Union (2005), and a Common Market (2010). All these efforts paid dividends as East Africa became a model in the rest of Africa when the global financial crisis hit the world and the growth that was experienced in 2009 and 2010 (Winston and Castellanos 2011).

The most important objective in this regional integration of the EAC states is the formation of East African Monetary Union (EAMU) with single currency by 2015 – it is still to be adopted as at the writing of this research. A road map was adopted in 2010 at the Joint Meeting of the EAC Ministers looking at the Exchange Rate Mechanism (ERM), creation of a regional central bank, and in the ultimate, the establishment of the EAMU.

Accordingly, it has emerged that EAC does not have a macroeconomic convergence as one of the criteria of optimum currency area (OCA) for the formation and adoption of a single currency (Katembo, 2008:107).

3.5 Convergence in East Africa Community

3.5.1 Macroeconomic Convergence Criteria

One of the most important criteria for the OCA theory is the macroeconomic convergence for forming a monetary union (Mundell 1961 and others). The EAMU is no exception. The EAC convergence process, according Mafusire and Brixiova (2013); measures mostly through macroeconomic criteria, has three stages: looser macro stance during 2007-2010; tighter one during 2011 -2014 and the monetary union from 2015 on (Table 3.1).

Frankel and Rose (1998), pioneered the endogeneity of OCA – it is self-fulfilling *ex post.* It underscores that by reducing transaction costs and eliminating the exchange rate risk, a common currency promotes intraregional trade and synchronised business cycles, as countries' economic institutions become similar. More recent work on the OCA Corsetti (2009) propounds that factors supporting monetary integration are financial sector integration and counter-cyclical fiscal policy, which are both high among priorities of the EAC policymakers.

Table 3.1: Macroeconomic convergence criteria in the EAC.

Indicator	<Stage

		Stage 1: 2007 – 2010	Stage 2: 2011 – 2014	Stage 3: 2015
Primary criteria	Budget deficit to GDP ratio			Introduction of single currency
	Excluding grants	< 6%	≤ 5%	
	Including grants	≤ 3%	≤ 2%	
	Inflation	≤ 5%	≤ 5%	
	External reserves	≥ 4 months Import cover	≥ 6 months Import	
Secondary criteria	Real exchange rate	Stable		
	Interest rates	Market based	Market based	
	Real GDP growth	≥ 7%	≥ 7%	
	Debt	Reduced to sustainable levels	Sustainable levels	
	Saving to GDP ratio	≥ 20%	≥ 20%	
	Current account (*excluding grants*)	Consistent with debt Sustainability	Consistent with Debt sustainability	
	Banking supervision and regulations	Implementation of the 25 Core principles		
	Payment and Settlement systems	Adhere to core principals for systematically Important systems		

Source: Adapted from Opolot and Luvanda (2009).

3.5.2 Macroeconomic performance

The EAC performed extremely well as compared to the rest of the continent this was even before and during the GFC, the lack of natural resources notwithstanding (Table 2). A negative of 5.8% in real GDP growth in 2009 for East Africa was posted and the recovery was realised in 2010 and 2012. Rwanda, Tanzania, and Uganda became shining example for this regional economic expansion and development.

Table 3.2: Real GDP growth in EAC and other Africa's sub-regions

	2002 – 2006	2007	2008	2009	2010	2011
	(Annual, in %)					
EAC	**6.6**	**7.1**	**7.4**	**4.1**	**5.1**	**5.6**
RoEA 2/	2.9	7.3	3.2	4.1	4.7	4.3
West Africa	4.7	4.7	5.4	3.4	4.5	5.1
Northern Africa	4.9	4.5	4.1	2.7	4.6	3.4
Southern Africa	4.5	5.5	4.7	2.2	4.2	5.6
Central Africa	4.6	4.0	2.9	2.0	5.5	4.3

Source: Mafusire & Brixiova

In 2008 Kenya's growth was hampered due to political upheavals that were seen after the elections having experienced growth between 2006 and 2007 alongside Ethiopia and Sudan. Burundi's fragility had an economic impact on her growth throughout the 2000s.

In 2007, inflation was in the single digits and due to mixed performance, jumped to double digits 2008, thanks to increased food prices. Drought contributed enormously to inflationary pressures and partly due to the world economic downswing between 2010 and 2011. "On the positive side, external debt is sustainable and debt payments are low, in part due to debt relief initiatives from mid-2000s" (Mafusire & Brixiova 2013).

Figure 2 shows variations in performance of the EAC member countries since 2000 and this does not auger well to meet the criteria of macroeconomic convergence. Only Tanzania and Uganda experienced an average GDP growth a little more than 7% between 2006 and 2010.

There were more unprocessed resources (without value adding) exported and this gave a glimmer that there was economic growth which ultimately is a risk for growth and employment, in particular, Uganda.

Inflation and exchange rates are still volatile and do not bode well for macroeconomic stability. Based on the above table, one of the most important criteria for OCA is similarity of inflation rates within the member states and this not the case as in 2011 inflation rate was double digits despite the target of 5% in Kenya, Uganda, and Tanzania, due to rising food prices. Ensuring adherence to macroeconomic targets in the absence of any agreed rules becomes cumbersome and a big ask to the proposed EAMU.

3.6 European Experience

3.6.1 Introduction

The regional integration in Europe that started with the Maastricht Treaty on 10 December 1991 gave rise to European Monetary Union (EMU) or simply European Union (EU) that culminated in the Euro Zone. There are some criteria to be met before a country could be admitted to be a member and are summarised as thus:

- The inflation rate in the year before admission must be no more than 1.5 percent above the average rate of the three EU member states with the lowest inflation rate.
- The country must have maintained a stable exchange rate within the exchange rate mechanism (ERM) without devaluing on its own initiative.
- The country must have a public-sector deficit no higher than 3 percent of its GDP
- The country must have a public debt that is below or approaching a reference level of 60 percent of its GDP (Krugman & Obstfeld 2006: 554).

It is for the above that evidently the theory of optimum currency area and its criteria were used for the creation of this monetary union. There is empirical literature review to enthusiastically to support or not to support this idea that SACU can/cannot be an optimum currency area.

3.6.2 The drivers of European Monetary Cooperation

There are reasons for that inspired EU countries to form a monetary union. This happened after the collapse of Bretton Woods system accompanied by the declining European confidence in the readiness of the United States to place its international monetary responsibility ahead of its national interest (Kohler *et al* 2010: 735). This is due to, firstly; the enhancement of Europe's role in the monetary system.

Secondly; to turn the European Union into a truly unified market. The aim here is to eliminate any trade barrier that could be a hindrance to trade and to transform EU into a colossal unified market modelled on the United States. The exchange rate uncertainty played a major role in the establishment of this regional integration. The intra-European relative prices and free trade within Europe would be strengthened.

Bayoumi and Eichengreen (1993) identified demand and supply shocks using the estimation procedure of Blanchard and Quah (1989). They found these correlations across the US regions to be higher than those in the EU member states.

It was also found that these demand and supply shocks were also higher in the European Free Trade Association (EFTA) such as Austria and Sweden.

3.6.3 European Economic and Monetary Union (EEMU)

The European Monetary System (EMS) was characterised by widespread government interventions that gave rise to national monetary policies. This did not go unheeded as in 1989 J Delors as the president of European Commission recommended a three-stage transition goal that culminated in the formation of EEMU (Krugman & Obstfeld 2006: 554). The member countries ultimately moved away from EMS and formed a single currency, the Euro on January 1, 2001 (*Ibid* 2006: 557) with the establishment of central bank in Frankfurt, the European Central Bank (ECB).

3.7 Empirical studies of the effect of exchange rate volatility on trade

Several studies have attempted to quantify the nature and magnitude of the relationship between exchange rate volatility and trade flows. Empirical tests of the hypothesis that exchange rate variability has a negative effect on the level of international trade provide no less confusing results than the theoretical models. Studies often find that the trade effect is of the wrong sign, statistically insignificant, or very weak. Results of the different studies are difficult to compare due to differences in the sample period, the countries investigated and the methodology employed. Empirical results also depend to a large extent on the measure of risk used; therefore the issue of exchange risk measurement has to be addressed before turning to the discussion of the various empirical studies.

3.7.1 Measures of exchange rate volatility

In order to investigate the effect of exchange rate volatility on trade empirically, volatility has to be measured. However, there is no unique way of measuring exchange risk. Most early studies have measured exchange rate volatility using the sample standard deviation method, either the standard deviation of the exchange rate or the standard deviation of the percentage change in the exchange rate. The disadvantages of this method are that it wrongly assumes that the empirical distribution of exchange rate is normal and it cannot differentiate between predictable and unpredictable elements in the exchange rate process, leading to volatility being overstated (Bah &Amusa 2002:13). In an attempt to measure the unanticipated change, some studies use the difference between actual and predicted forward rate. Others utilize a time-series model for exchange risk to account for trends. McKenzie (1999:100) notes that more recent studies give special attention to the specification of the technique by which exchange rate volatility is measured and have more success in deriving a statistically relationship between volatility and trade.

The problem is that the different measures of exchange rate volatility used in empirical studies are not necessarily good proxies for exchange rate uncertainty. The reason is that it is not exchange rate variability but rather unanticipated variability that depresses trade volumes due to higher risk experienced by traders. For example, traders may predict exchange rate fluctuations caused by diverging inflation rates, in which case there would be no effect on trade. In practice, ex post measures of exchange rate variability may only be roughly related to ex-ante perceptions of unforeseen exchange risk (Brada& Mendez 1988: 265). Therefore the different variability measures used are unlikely to be good proxies for the dispersion of economic agents' subjective probability distributions of expected exchange rate changes (Willet 1986: S106). Many empirical studies emphasize that the choice of the best measure of volatility is crucial, yet they neglect to properly define the difference between expected and unexpected volatility (Pickard 2003:10).

Sharp increases in exchange rate volatility since the early 1970s appear to have had few adverse effects on trade volumes. In this period international trade has grown faster than world output, just the opposite of what one would expect if increasing exchange rate volatility had a negative impact on trade (Moreno 2000). However, increasing exchange rate volatility does not necessarily imply increasing uncertainty. Exchange rate uncertainty can be high whether exchange rate volatility is high or low, or whether the currency is pegged or floating. In principle, a fixed exchange rate system should mean the elimination of exchange rate risk, but in practice, fixed regimes are vulnerable to sudden collapse. Obstfeld and Rogoff (1995) find that only six economies with open capital markets, in addition to a number of very small economies, maintained fixed exchange rate variability under fixed rates, there is considerable unanticipated exchange risk because there is uncertainty about the timing of devaluation (Brada& Mendez 1988:266). If uncertainty about the sustainability of a fixed exchange rate is a deterrent to trade, then the complete elimination of exchange rate uncertainty and the irreversibility of exchange rate fixing in currency unions can be expected to promote trade. Direct studies investigating the trade effect of common currencies will be discussed in detail in the remaining chapters of the dissertation.

3.7.2 Empirical results

The empirical literature about the effect of exchange rate volatility on trade is vast. This section presents a survey of the literature and highlights the degree to which the research results are ambiguous.

One of the earliest empirical studies on the impact of exchange rate volatility on trade was done by Hooper and Kohlhagen (1978) who tested their theoretical model (see section 3.1.3) by analysing US and German trade flows for the period 1965 to 1975. The empirical result confirms the finding of their theoretical model that exchange rate risk has a significantly negative impact on the market price where the importers are likely to bear the risk, and a positive impact in cases where the risk is borne by exporters. However, they find absolutely no significant effect of exchange rate risk on the volume of trade, even after experimenting with alternative risk proxies and alternative functional forms of the quantity equation. In their view, the absence of a significant impact of volatility on trade volumes might be attributable to relatively inelastic export supply in the short run, or to substantial hedging by importers and exporters. The conclusion reached by Hooper and Kohlhagen (1978) is representative of the early empirical literature. Along this line, the IMF produced a survey in 1984 and found that the majority of empirical studies failed to establish a systematically significant relationship between measured exchange rate variability and international trade levels (International Monetary Fund 1984:36).

Studies that do find a statistically significant negative impact of exchange rate volatility on trade include De Grauwe and Verfaille's (1988) investigation of bilateral trade among fifteen industrial countries for the period 1975 to 1985. Estimates from a cross sectional model show that the level of trade is significantly stronger within the European Monetary System (EMS) than outside the EMS. Volatility is estimated to have reduced the growth rate of exports outside the EMS by approximately 9 percent. Focusing on more recent data, Anderton and Skudelny (2001) estimate euro area import demand functions for the period 1989 to 1999. They use pooled data across imports of the individual euro area countries from their main trading partners, the US, Japan, Denmark, Sweden, the UK and Switzerland. Importers are assumed to use information from the past as well as the current period to assess exchange risk, therefore various moving-average measures of volatility are used as proxies for exchange risk. The panel estimates imply that extra-euro area exchange rate volatility may have decreased extra-euro imports by approximately 10 percent – up to a maximum of 14 percent in the long run. The authors also provide some limited evidence that differences in extra – and intra-area exchange rate volatility lead to substitution between extra – and intra-area imports.

While the majority of studies find an insignificant or a negative relationship between exchange rate volatility and trade, a number of authors present empirical evidence of the alternative hypothesis that exchange rate volatility might be beneficial to trade. Studies which find positive relations include Daly's analysis of bilateral trade between Japan and seven industrialized countries that shows that volatility has a significant positive effect on seven import and five export flows out of fourteen (Flam &Jansson 2000:7). Asseery and Peel (1991) examine the effect of volatility on multilateral export volumes of five industrial countries and find significantly positive relations for all countries except the United Kingdom. Kroner and

Lastrapes (1993) also find that an increase in volatility may be associated with an increase in international trade. They find a negative volatility effect only for the United States and the United Kingdom, for the other countries the effect of volatility on trade is found to be positive. McKenzie and Brooks (1997) find a clearly positive association between US-German trade flows and exchange rate volatility.

The above examples illustrate the ambiguity that characterises the empirical literature on the trade effect of exchange rate volatility. Some studies find no significant effect of volatility on trade, others find a significant negative effect, and some even find a significant positive effect. However, even when the effect is statistically significant, the magnitude of the effect is generally low.

3.8 Conclusion

The original member states duly met the criteria established in being part of the Euro Zone and most notably the macro-economic convergence and lower inflation rates that were almost similar.

East Africa regional bloc, based on the findings of Mafusire and Brixiova (2013), does not meet a minimum criteria of macroeconomic convergence and similarities in inflation rates as such is not an optimum currency area and cannot have a single currency.

The core research areas of this study is based on inflation, exchange rates and gross domestics of the SACU regional bloc in finding out if she (SACU) can or cannot be an optimum currency area. This is investigated in the following two chapters 4 and 5 and chapter 6 will give recommendations and conclusion.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

The chapter deals with research methodology and data analysis. The chapter is divided into three sections. The first section outlines the chapter. The second section, data description, outlines all areas concerning the formulation and use of data in the overall study, including the sources of data and information. The third section gives a description of the model used in the study in full detail.

4. 2 Data and Variables

All the data were obtained from the Quantec and World Bank. The data are annually and cover the period from 1980 to 2015. The period gives a clear trend of what happened during the apartheid era and after apartheid. In addition, 1980 to 2015 create enough observations to run a regression model.

Inflation

Inflation is defined according to Parkin (2013: 574) as the persistently rising price level. To epitomise it; inflation is when little goods are being chased by more money.

Exchange Rate

An exchange rate is the price at which one currency exchanges for another currency in the foreign exchange market (Parkin 2013: 574).

Gross Domestic Product (GDP)

GDP is defined as the value of all final goods and services produced within the boundaries of a country, calculated quarterly or annually (Parkin 2013: 446).

Table 4.1 Descriptive Statistics of Growth Rate in Real exchange rate of SACU (1980-2015)

Country	Code	Mean	Median	Std.Dev.	Skewness	Kurtosis	p-value
S. Africa	ZAF	4.654112	4.639528	0.218427	0.374886	2.755784	0.627288
Botswana	BWA	4.051672	3.938322	2.339399	0.160271	1.541671	0.187852
Namibia	NAM	5.222580	5.068123	3.092161	0.147915	1.632430	0.230312
Lesotho	LSO	4.885373	5.290995	0.390048	-0.521827	1.842066	0.161618
Swaziland	SWZ	7.606107	7.492155	4.826453	0.288203	1.875569	0.301966
SACU Average		5.283969	5.285825	2.173298			

Table 4.1 is indicating the performance of SACU countries in relation to growth rate in real exchange rate from 198-2015 based on measures of central tendency and standard deviations.

Table 4.2 Descriptive Statistics of Growth Rate in Real inflation rate of SACU (1980-2015)

Country	Code	Mean	Median	Std.Dev.	Skewness	Kurtosis	p-value
S. Africa	ZAF	4.232207	4.468798	0.903430	-0.578450	2.138309	0.209990
Botswana	BWA	9.636111	8.755000	2.610276	0.995716	3.485956	0.042789
Namibia	NAM	9.527985	8.963876	5.468169	0.649955	3.234934	0.270166
Lesotho	LSO	11.49805	11.69251	7.220775	0.084888	5.187906	0.027003
Swaziland	SWZ	9.841972	8.100500	4.738423	0.759031	2.967542	0.177431
SACU Average		8.947265	8.396137	4.188215			

Table 4.2 is describing the growth rate in real inflation rate from 1980-2015 using measures of central tendency standard deviations.

Country	Code	Mean	Median	Std.Dev.	Skewness	Kurtosis	p-value
S. Africa	ZAF	5.784216	5.737147	0.498850	0.098589	1.792879	0.326005
Botswana	BWA	14.79747	11.40800	10.92727	0.567355	2.043658	0.191739
Namibia	NAM	5.93	5.25	2.26	0.06576	1.962418	0.147897
Lesotho	LSO	2.361222	2.034500	1.479433	0.678596	2.332215	0.179796
Swaziland	SWZ	4.564556	4.431000	2.443328	0.157571	1.829369	0.332117
SACU Average		6.687493	5.772129	3.521776			

Table **4.3 Descriptive Statistics of Growth Rate in Real GDP of SACU (1980-2015)**

Table 4.3 elaborates on growth rate in real GDP from 1980-2015 using measures of central tendency and standard deviations.

4.2 Methodology

To investigate inflation and exchange rates as criteria for optimum currency area specifically to SACU as a regional bloc. The model used was a very basic model, which just sought to establish the relationship between the external value of a currency, the real exchange rate (which is the independent variable) and real GDP and the domestic value of a currency (inflation), (which are the dependent or explanatory variables).

4.2.1 Model Specification for Real GDP and Inflation Analysis in SACU

$$x_t = \alpha + \beta \log(y_t) + \mu i_{t-1}$$

Where: x_t is the exchange rate (4.1)

y_t is real output

i_t is inflation

Changes in the domestic price level (inflation), are assumed to have a lagged effect on the exchange rate, which means for instance, a fall in the value of the rand domestically does not have an immediate impact on the value of the rand in relation to other currencies. In order to reach a decision as to whether a country or regional bloc should abandon its currency and join a common currency is desirable or not, is essential to weigh the exchange and inflation rates if there is any commonality (SABITA, 2002).

Research is by its nature, cynical or more exactly, helical. A research process follows a cycle and begins simply (Leedy, 2001:8). To this end, data collection includes and/or involves a range of activities from national to international statistics to be used to authenticate and give credible outcomes. The aim is to fulfill the internal and external validities.

The research focusses on secondary data which is captured at a point of being generated to give an impetus that will ultimately be analysed using various research techniques as they have a specific purpose in mind (Wagner, 2007:26). To this end, research has been defined differently by different authors but all definitions are in consensus that a research is a process of enquiry and investigation, highly systematic and methodical and as thus increases knowledge (Hussey & Hussey, 1997). According to Leedy (1993), "a research is a studious inquiry or examination, especially a critical and exhaustive investigation or experimentation having its aim, the recovery of new ideas and facts and their correct interpretation, the revision of accepted conclusions, theories, or laws in the light of newly discovered facts or the practical application of such conclusions, theories or laws". Most researchers use a systematic approach to collect and interpret information to solve minute problems of daily living (Leedy, 2001:4).

The model describes the relationship between Inflation and Exchange Rates in 5 countries. The idea behind the model is to show that these countries that belong to the SACU can be an optimum currency area. As noticed from the regression model results, it is clearly evident that the coefficients are negative, which tells us that there is an inverse relationship between exchange rates and inflation for all the SACU members.

It has also being noticed that both the inflation and the exchange rates for all the countries go in tandem with each other. This observation then leads us to the conclusion that it would be economically beneficial for the 5 countries to be an optimum currency area.

The study estimates whether Southern African Custom Union (SACU) is an optimum currency area? Using the following equation:

$$EXR_t = f\,(CPI_t, GDP_t, \varepsilon_t) \qquad (4.2)$$

Where:

EXR= Real Exchange Rate

CPI=Consumer Price Index

GDP = Gross Domestic Product (real)

ε_t = Error term

EXR is a dependent variable. CPI and GDP are independent variables. These variables may have a positive or negative relationship depending on their results on the exchange rate. The model is specified as follows in the linear regression:

$$EXRt = \beta 0 + \beta 1CPIt + \beta 2GDPt + \varepsilon t \quad (4.3)$$

Where:

$\beta_0$is a constant

$\beta_1$is a coefficient that is, 1,2….n

4.2.2 Model Specification for Generalised Purchasing Power Parity Analysis in SACU

The theory of generalised purchasing power parity (GPPP) is based on the law of one price. In its pure format relates to the idea of the absence of trade barriers like transportation, transaction costs and tariffs, as a result; competition tends to equalise the price the price of an homogeneously traded good across countries, when the price are expressed in the same currency. This theory propounds that a currency unit should be able to buy the same basket of goods in two countries to enhance power parity across the two countries (Taylor & Taylor 2004).

Zehirun *et al* 2015 applied this theory (GPPP) to SADC for real exchange rates in 'evidence from cointegration and unit panel root tests'. The results evidently shows that GPPP hypothesis holds positively for SADC economies being a potential OCA. In the case of this research, investigation is to use inflation homogeneity, real GDP and real exchange rates of SACU members as catalysts to find out if SACU is an OCA or not.

The study uses five SACU members. The study employs different methodologies to answer the research questions stated in chapter one. The Purchasing Power Parity (PPP) approach measures the real exchange rate as the price of foreign goods relative to that of domestic goods. In its simplest form, under PPP the real exchange rate (RER) is the nominal exchange rate (NER) multiplied by the relative prices relative prices of trading countries, that is;

$$RER = NER\frac{P*}{P} \qquad (4.4)$$

where P* and P are the foreign and domestic prices respectively.

Alternatively, we can express equation (4.4) in logarithmic form (in the most standard definition (Chinn, 2006)) such that the series of interest for country '*i*' at time't', is given by the following equation:

$$r_{i,t} = s_{i,t} + p^{*}_{us,t} - p_{i,t} \qquad (4.5)$$

where $r_{i,t}$ is the logarithm of the RER against the US dollar, $s_{i,t}$ is the logarithm of the NER against the US dollar, $p^{*}_{us,t}$ and $p_{i,t}$ respectively, are the logarithms of consumer price indices in the US and country '*i*'. Using equation (4.5) we compute the RER series for the countries included in this study. A time series of RER $\{r_t\}$ is stationary if the following relation holds true under the assumption of linearity.

When β=1, equation (4.6) becomes a unit root process. It means the process does not allow the system to come back to equilibrium which limits the usefulness of PPP as a tool to assess the monetary integration.

However, the GPPP hypothesis can be used under such conditions. GPPP can be described as follows assuming an *n*-country world; an *m*-country ($m \leq n$) currency area exists such that a long-run equilibrium relationship exists between the *m-1* bilateral exchange rates, of the form (Enders & Hurn, 1994; Wilson & Choy, 2007; Beirne, 2008, Zerihun 2014).

Where r_{i1t} is the log of the bilateral RER in period *t* between country 1 and country i ; α is the intercept term ; β_{i1t}'s are the parameters of the cointegrating vector, which represent the degree of co-movement of the RERs; and is ε_t a stationary stochastic disturbance term.

Equation (4.5) is the spill-over effect due to real shock in country *i* that are transmitted to other economies that have high degrees of economic interdependence with country *i (*Beirne, 2008*)*. GPPP holds when at least one linear combination of bilateral RERs is observed. The existence of linear combinations implies that output shocks have a symmetrical effect on the RERs in a given area (Ogawa & Kawasaki, 2001; Beirne, 2008). Mathematically,

$$r_{i0t} = \sum \beta_j r_{j0,t} + \varepsilon_{GPPP,t} \tag{4.6}$$

where the residual term, $\varepsilon_{GPPP,t}$, is stationary:

We adopt the Johansen (1996) multivariate maximum likelihood estimation (MMLE)[1] procedure because it assumes all variables to be endogenous and does not require the choice of a dependent variable. The Johansen method tests the restrictions imposed by co-integration of the unrestricted Vector Auto Regression (VAR) involving the series.

To test whether the $n-1$ set of countries form an OCA, following Beirne (2008) the VAR (k) is set up in the following matrix notation.

$$z_t = A_1 z_{t-1} + \ldots + A_k z_{t-k} + \varepsilon_t \qquad \varepsilon_t \sim IN(0, \Sigma) \tag{4.7}$$

where z_t is the log of the RER in the form of (n×1) and A_i represents a matrix of parameters (n×n).

In line with the Vector Error Correction Model (VECM), we can rewrite Equation (4.7) as follows (in first-difference form):

[1] The principle of *maximum likelihood estimation* (MLE), originally developed by R. A. Fisher in the 1920s, states that the desired probability distribution be the one that makes the observed data most likely, which is obtained by seeking the value of the parameter vector that maximizes the likelihood function.

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + \ldots + \Gamma_k \Delta z_{t-k+1} + \Pi z_{t-k} + \varepsilon_t \tag{4.8}$$

where short run information is given by Γ_i which represents - $(I - A_1 - \ldots - A_i), (i = 1, \ldots, k-1)$, and long run information is provided by Π which represents $-(I - A_1 - \ldots - A_k)$. Thus the hypothesis to be tested is given by:

$$H_1(r): \Pi = \alpha.\beta' \tag{4.9}$$

where, α is the loading matrix known as the adjustment parameter in VECM and the reduced rank where, r is the number of co-integrating relationships.

Granger's representation theorem indicates that if the coefficient matrix Π has a reduced rank $r < n-1$, there exists $(n-1) \times r$ matrices α and β each with rank r such that $\Pi = \alpha.\beta'$ and $\beta'.z_t \sim I(0)$.

Finally, the Johansen method estimates the matrix from an unrestricted VAR and tests whether we can reject hypothesis 1 (equation 4.9) on the reduced rank of Π. When the matrix is stable, there is a long-run relationship among $n-1$ real exchange rates whose countries can form an OCA (Sugimoto, 2008).

To test the hypothesis in equation (4.9) using the Johansen co-integration procedure, we can have two specific test statistics; one relating to the trace[2] test and the other to the maximum Eigen-value test. Both tests yield the number of co-integrating vectors in the system. The null hypothesis is that there are at most 'r' co-integrating vectors, i.e. ($0 \leq r \leq n$). The trace test statistics is computed as follows:

$$\lambda_{trace} = -N \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \tag{4.10}$$

[2]Both trace and maximum eigenvalue tests are likelihood ratio type tests, however, both operate under different assumptions regarding the deterministic part of the data generation process. The trace test tends to have more distorted sizes whereas their power in some situations superior to that of the maximum eigenvalue tests (Lutvephol, 2000).

Where λ_i are the (n-r) smallest squared canonical correlations of $z_{t-1 \text{ with}}$ respect to Δz_t, corrected for lagged differences and N is the sample size.

The maximum Eigen-value test is computed as follows:

$$\lambda_{\max} = \text{-N} \ln(1 - \lambda_{N+1}) \qquad (4.11)$$

With the maximum Eigen-value test, the null hypothesis is that there are 'r' co-integrating vectors against the alternative that r+1 exist. Thus, rejection of the hypothesis implies that a maximum of 'r' co-integrating vectors exist.

4.4 Cointegration Analysis

Subsequent to establishing that variables are stationary, it is crucial to determine whether or not there is any long-term relationship between them, this means testing the cointegration. Thus, two time-series integrated in the order d are said to be cointegrated if one unique linear combination of these series exists which is integrated in an order inferior to (d-b) with b ≥1. Thus, in order to test the co-integration between variables, two approaches can be used: the Engler-Granger two-step approach or the Johansen procedure.

4.4.1 Johansen Approach to cointegration

This is based on a VAR approach to cointegration. All the variables are assumed to be endogenous (although it is possible to include exogenous variables). The test relies on the relationship between the rank of a matrix and its eigenvalues or characteristic roots. The approach to testing for cointegration in a multivariate system is similar to the ADF test, but requires the use of a VAR approach:

$$x_t = A_1 x_{t-1} + u_t \qquad (4.12)$$

$$\Delta x_t = (A_1 - I) x_{t-1} + u_t$$

$$\Delta x_t = \pi x_{t-1} + u_t$$

Where: $\pi = (A1 - I)$

Where in a system of g variables:

X_t and $U_t$are g x 1 vectors.

A_1 is an g x g matrix of parameters

*I*is an g x g identity matrix

The rank of π equals the number of cointegrating vectors. If π consists of all zeros, as with the ADF test, the rank of the matrix equals zero, all of the xs are unit root processes, implying the variables are not cointegrated. As with the ADF test, the equation can also include lagged dependent variables, although the number of lags included is important and can affect the result. This requires the use of the Akaike or Schwarz-Bayesian criteria to ensure an optimal lag length.

4.3 Estimation methods

The study uses estimation method of three steps tests which is unit root tests, cointegration test and error correction model to determine the short-run and long-run relationship between exchange rate, consumer price index and economic growth.

4.3.1 Unit root test

The unit root test is vital because it allows examining whether a time series is stationary or not. Eloquent the existence of a cross sectional' stationarity is important for three main reasons. Firstly, a fundamental question in the ARIMA modeling of a single time series is the number of times the series needs to be for the first differenced before fitting the ARIMA model because each unit root requires a differencing operation. Secondly, stationarity in regression model is understood in the derivation of standard inference procedure. Non-stationary of regression model invalidates the standard results. Thirdly, one of the most important questions in cointegration is whether the disturbance term of the cointegration vector has a unit root.

4.3.2 Augmented Dickey-fuller (ADF) test

The effort of this is to determine whether the variables follow a non-stationary trend and are in fact of the order of 1, denoted as I(1) or whether the series are stationary, i.e. of the order of 0 denoted as I(0). The Augmented Dickey-Fuller (ADF) tests are based on the estimation of the following regression.

$$\Delta Xt = \alpha o + \alpha 1 + \alpha 2Xt - 1 + \sum \Delta Xt - 1 + \Phi t \qquad (4.13)$$

Where Δ is the first difference operator, t is a linear time series trend and Φt is a normally distributed error term. In (3), the null hypothesis that H0: a2 = 0 against the alternative hypothesis H1: a2 ≠ 0 is tested by comparing the calculated t-ratio of ã2 with Mackinnon critical values, which are essentially adjusted t values. If the absolute value of the calculated t-ratio is greater than the significant value, then the null hypothesis of a unit root (non-stationarity) is rejected, and the time series Xt can be characterised as integrated of order zero, i.e. I (0), in levels.

4.4.2 Error Correction Models

An error correction model includes only I(0) variables. This requires all non-stationary variables to be first-differenced, to produce stationary variables. The error correction term is the residual from the cointegrating relationship, lagged one time period, this too will be I(0) if the variables are cointegrated. The error correction model can include a number of lags on both variables. The ECM models the short-run dynamics of the model. As with short-run models including lags, it can be used for forecasting. The coefficient on the error correction term can be used as a further

4.5 Summary

Chapter 4 introduced the economic model and the hypotheses tested in the study. The econometric models, as well the methodologies that are followed, are outlined in these chapter. The chapter considered the data issues and the methodological aspect to carry out the investigation of the determinants of private investment. The approaches discussed are the static OLS and the techniques of cointegration and error correction modelling.

CHAPTER FIVE

DATA ANALYSIS AND INTERPRETATION

5.1 Introduction

The chapter is divided into four sub-sections. The first presents the results of stationarity/ unit root tests, the second presents and discusses the Johansen cointegtation test results; the third section discusses the long run relationship (ECM). The next section presents the diagnostic tests and stability tests while the last section concludes this chapter.

5.2 Unit root test results

Augmented Dickey-Fuller (ADF) tests (Dickey and Fuller 1981) are employed to identify the order of integration (that is the number of times a variable needs to be differenced to make it stationary). The graphical examination of the series is very vital before any form of analysis. This graphical examination allows us to have an idea of the stationarity of the data. The variables are exchange rate (EXPR), CPI (Consumer Price Index) and Gross Domestic Product (GDP) ***(See graphs at the annexure)*.**

5.3 Formal unit root testing ADF test

The formal testing procedures presently accessible are used to examine each of the variables and countries. To establish the integrating order I (1) of cross sectional countries, the Augmented Dickey Fuller (1981) is used to test each variable for unit root in levels, and then in the first difference form. These tests are based on the following assumptions:

H_o: unit root exist

H1: unit root does not exist

Interpretation of unit root results is based on comparing their t-statistics with their critical values:

If t*>ADF critical values: accept the null hypothesis (non-stationary)

If t*>ADF critical values: reject the null hypothesis (stationary)

Table 5.1: *unit root test at levels*

Table 5.1 GDP for Botswana, South Africa, Swaziland, Lesotho and Namibia

Countries	Model	ADF	ADF (t-	Critical	Conclusion

		Lags	**Statistics)** $\tau_{\tau}\tau_{\mu}\tau$	**value at 5%**	
South Africa	Trend and intercept	0	-2.319658*	-3.548490	Unit root
Botswana		0	-0.204602	-3.544284	No unit root
Namibia		0	-2.188218*	-3.544284	Unit root
Swaziland		0	-1.791257*	-3.544284	Unit root
Lesotho		0	1.599768	-3.544284	No Unit root
South Africa	Intercept	0	-1.024271 *	-2.948404	Unit root
Botswana		0	4.551806	-2.948404	No unit root
Namibia		0	0.523039*	-2.948404	Unit root
Swaziland		0	2.069433	-2.948404	No unit root
Lesotho		0	9.288709	-2.948404	Unit root
	None				
South Africa		0	7.161427*	-1.950687	Unit root
Botswana		0	-2.339063	-1.950687	No unit root
Namibia		0	3.244038*	-1.950687	Unit root
Swaziland		0	2.069433	-2.948404	No unit root
Lesotho		0	20.28462	-1.950687	Unit root

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

The table 5.1 above presents the results of running ADF test on all countries at levels in logarithm form with trend and intercept and intercept. The results above shows that log of GDP in five countries show the existence of unit root which is non-stationary in levels where there is only in none and unit root exists in South Africa, Namibia and Lesotho's GDP in intercept, trend and none which is also non-stationary. While Botswana and Swaziland are stationary (no unit root), thus the results from the above table 1 indicate that the null hypothesis of non-stationarity is rejected (unit root does not exist

Table 5.2: *Unit root at first difference*

GDP for Botswana, South Africa, Swaziland, Lesotho and Namibia

Countries	**Model**	**ADF** Lags	**ADF (t-Statistics)** $\tau_\tau \tau_\mu \tau$	**Critical value at 5%**	**Conclusion**
South Africa	Trend and intercept	0	-5.375000	-3.548490	No unit root
Botswana		0	-6.071659	-3.548490	No unit root
Namibia		0	-5.636711	-3.548490	No unit root
Swaziland		0	-3.467946	-3.548490	No unit root
Lesotho		0	-4.475819	-3.548490	No unit root
South Africa	Intercept	0	-5.529590	-2.951125	No unit root
Botswana		0	-3.858381	-2.951125	No unit root
Namibia		0	-5.526027	-2.951125	No unit root
Swaziland		0	-3.157488	-2.951125	No unit root
Lesotho		0	-0.983316	-2.954021	No unit root
South Africa	None	0	-2.799929	-1.951000	No unit root
Botswana		0	0.704480	-1.952066	No unit root

Namibia		0	-4.383657	-1.951000	No unit root
Swaziland		0	-12.39882	-1.951000	No unit root
Lesotho		0	-4.044292	-1.951000	No unit root

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

The results from table 5.2 show that when the ADF test is applied to GDP in five countries in first differences with the trend and intercept, intercept and none, all of the countries are stationary in first difference. Thus the null hypothesis of non -stationarity is rejected (no unit root) and the variables are integrated of order one I(1).

Table 5.3: *Unit root at levels*

Exchange rate for Botswana, South Africa, Swaziland, Lesotho and Namibia

Countries	**Model**	**ADF** Lags	**ADF (t-Statistics)** $\tau_\tau \tau_\mu \tau$	**Critical value at 5%**	**Conclusion**
South Africa	Trend and intercept	6	-2.482713*	-3.544284	Unit root
Botswana		6	-2.488868*	-3.544284	Unit root
Namibia		6	-3.550218	-3.544284	No unit root
Swaziland		6	-3.550220	-3.544284	No unit root
Lesotho		6	-2.007602*	-3.544284	Unit root
South Africa	Intercept	6	-1.656657*	-2.948404	Unit root
Botswana		6	-0.114934*	-2.948404	Unit root

Namibia		6	0.768326*	-2.948404	Unit root
Swaziland		6	-0.857155*	-2.948404	Unit root
Lesotho		6	-0.534128*	-2.948404	Unit root
South Africa	None	6	-1.608496*	-1.950687	Unit root
Botswana		6	2.553575*	-1.950687	Unit root
Namibia		6	0.768326*	-1.950687	Unit root
Swaziland		6	0.768326*	-1.950687	Unit root
Lesotho		6	-1.618725*	-1.950687	Unit root

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

The table 5.3 above presents the results of running ADF test on all countries at levels in logarithm form with trend and intercept and intercept. The results above shows that log of exchange rate in five countries show the existence of unit root which is non-stationary in levels where there is only in none and unit root exists in more in all countries in constant and none, while in trend unit root exist in South Africa, Botswana and Lesotho's exchange rate in trend, trend and none which is also non-stationary. While Swaziland and Namibia are stationary (no unit root) in trend, thus the results from the above table 5.3 indicates that the null hypothesis of non-stationarity is rejected (unit root does not exist) and accepted in constant and none (unit root existed).

Table 5.4: Unit root at first difference

Exchange rate for Botswana, South Africa, Swaziland, Lesotho and Namibia

Countries	**Model**	**ADF** Lags	**ADF (t-Statistics)** $\tau_\tau \tau_\mu \tau$	**Critical value at 5%**	**Conclusion**
South Africa	Trend and intercept	0	-4.973955	-3.548490	No unit root
Botswana		0	-4.674230	-3.548490	No unit root
Namibia		0	-6.177329	-3.548490	No unit root
Swaziland		0	-6.177330	-3.548490	No unit root
Lesotho		0	-5.325390	-3.548490	No unit root
South Africa	Intercept	0	-4.996143	-2.951125	No unit root
Botswana		0	-4.739801	-2.951125	No unit root
Namibia		0	-6.282054	-2.951125	No unit root
Swaziland		0	-6.282054	-2.951125	No unit root
Lesotho		0	-5.382380	-2.951125	No unit root
South Africa	None	0	-4.815741	-1.951000	No unit root
Botswana		0	-3.922859	-1.951000	No unit root
Namibia		0	-5.948732	-1.951000	No unit root
Swaziland		0	-5.948733	-1.951000	No unit root
Lesotho		0	-5.149889	-1.951000	No unit root

Eviews 8 (2015)

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

The results from table 5.4 show that when the ADF test is applied to exchange rate in five countries in first differences with the trend and intercept, intercept and none, all of the countries are stationary in first difference. Therefore, the null hypothesis of non -stationarity is rejected (no unit root) and the countries are integrated of order one I(1).

Table 5.5: *Unit root at levels*

Inflation rate for Botswana, South Africa, Swaziland, Lesotho and Namibia

Countries	**Model**	**ADF** Lags	**ADF (t-Statistics)** $\tau_\tau \tau_\mu \tau$	**Critical value at 5%**	**Conclusion**
South Africa	Trend and intercept	0	-2.399531*	-3.544284	Unit root
Botswana		0	-3.792730	-3.544284	No unit root
Namibia		0	-5.654350	-3.544284	No unit root
Swaziland		0	-4.965836	-3.544284	No unit root
Lesotho		0	-6.606054	-3.544284	No unit root
South Africa	Intercept	0	0.756852*	-2.948404	Unit root
Botswana		0	-3.048815	-2.948404	No unit root
Namibia		0	-4.888887	-2.948404	No unit root
Swaziland		0	-3.398919	-2.948404	No unit root
Lesotho		0	-5.212479	-2.948404	No unit root
South Africa	None	0	4.635905*	-1.950687	Unit root
Botswana		0	-1.075522*	-1.950687	Unit root
Namibia		0	-1.806195*	-1.950687	Unit root
Swaziland		0	-1.776657*	-1.950687	Unit root

Lesotho		0	-2.378485	-1.950687	No unit root

Eviews 8 (2015)

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

The table 5.5 above presents the results of running ADF test on all countries at levels in logarithm form with trend and intercept and intercept. The results above shows that log of inflation rate (CPI) in five countries show the existence of unit root which is non-stationary in levels where there is only in none and unit root exists in South Africa in level and none Botswana, Namibia, Swaziland, while no unit root exists in trend and constant, none in all four countries expect South Africa , thus the results from the above table 5 indicates that the null hypothesis of non-stationarity is rejected (unit root does not exist) and accepted in constant and none (unit root existed).

Table 5.6: *Unit root at first difference*

Inflation rate for Botswana, South Africa, Swaziland, Lesotho and Namibia

Countries	**Model**	**ADF** Lags	**ADF (t-Statistics)** $\tau_\tau \tau_\mu \tau$	**Critical value at 5%**	**Conclusion**
South Africa	Trend and intercept	6	-2.308578*	-3.548490	Unit root
Botswana		6	-8.985036	-3.548490	No unit root
Namibia		6	-8.354573	-3.548490	No unit root
Swaziland		6	-8.276357	-3.548490	No unit root
Lesotho		6	-10.14949	-3.548490	No unit root
South Africa	Intercept	6	-2.709996*	-2.951125	Unit root

Botswana		6	-9.097821	-2.951125	No unit root
Namibia		6	-8.395514	-2.951125	No unit root
Swaziland		6	-8.355658	-2.951125	No unit root
Lesotho		6	-10.30437	-2.951125	No unit root
South Africa	None	6	-1.811996*	-1.951000	Unit root
Botswana		6	-9.082053	-1.951000	No unit root
Namibia		6	-2.951125	-1.951000	No unit root
Swaziland		6	-8.371267	-1.951000	No unit root
Lesotho		6	-10.45106	-1.951000	No unit root

Eviews 8 (2015)

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

The results from table 5.6 show that when the ADF test is applied to inflation rate (CPI) in five countries in first differences with the trend and intercept, intercept and none, all of the countries are stationary in first difference, except for South Africa. Therefore the null hypothesis of non - stationarity is rejected (no unit root) and the countries are integrated of order one I(1).

5.4 Cointegration analysis

Outlines the existence of an equilibrium or stationarity relationship among two or more times series each of which is individually non stationary. Two conditions must be met for two or more variables to be cointegrated. Firstly, they must be integrated of the same order. Secondly, linear combinations of the variables from the regression of the non-stationary variables (in levels form) must be stationary. In this study, the Johansen's (Johansen 1988; Johansen and Juselius 1990) maximum likelihood approach is used to test for cointegration. This approach has been shown to be superior to Engle and Granger's (1987) residual-based approach; amongst other things, the

Johansen approach is capable of detecting multiple cointegrating relationships. These tests are based on the following assumptions:

H_o: there is no cointegration

H1: there is cointegration

5.4.1. GPPP test using Johansen multivariate Co-integration test on SACU region (Trace and Max-Eigen statistic)

Table 5.9: GPPP results from real exchange rate in five countries:

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Max-Eigen Statistic	0.05 Critical value
None*	0.999403	376.2926	69.81889	230.1323	33.87687
At most 1*	0.912513	146.1603	47.85613	75.52406	27.58434
At most 2*	0.805158	70.63628	29.79707	50.70263	21.13162
At most 3*	0.470644	19.93365	15.49471	19.71894	14.26460
At most 4	0.006902	0.214703	3.841466	0.214703	3.841466

Trace test indicates 1 cointegrating equation(s) at the 0.05 level

Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

******MacKinnon-Haug-Michelis (1999) p-values (LAG LEVEL=1-4

Table 5.7, Table 5.8 and Table 5.9 above gives the GPPP results from Johansen cointegration test. The first column of the table gives tests for hypothesised number of cointegrated equation where the null hypothesis ranging from no of cointegration relationship(r = p) up to most two cointegration vectors. The second column gives the Eigen-values in descending order, while the third and fifth column reports the corresponding trace statistics and max-Eigen statistics generated. The fourth and sixth column reports the critical values at the five per cent levels.

The findings ofthe trace test statistic shows two cointegrating equations at 5% level, having the rejection of the null hypothesis of no cointegration of the series. On the other hand, the maximum eigenvalue statistic indicates the presence of two cointegrating equations at 5% level.The trace test shows that there is 5 per cent significance co-integration equation. This is shown by comparing the trace statistics as it shows that 99.747758 is greater than critical value 69.81889 and 28.78822 is also greater than the critical value 27.58434.The max-eigen statistic that indicates that there is 5 percent significance cointegration. This is realised by comparing the max-eigen statistics as it shows that 44.48817 is greater than the critical value 33.87687 and 28.78822 is also greater than the critical value 27.58434.

The findings show that both the Trace and Maximum Eigen value test are significant at 5 percent level. These findings prove that the variables are tied together in a single way in the long run; there is no unique long run equilibrium relationship. Thus there is one cointegration relationship in the trace static model and two cointegration relationships in the maximum Eigen model. Therefore, the existence of a long run relationship of the model can be seen within an Error Correction Model (ECM).

5.5 Error Correction Model (ECM)

The ECM techniques allow the long run and short run dynamics to be estimated in a single step. The constant term of the single error correction framework is a combination of the short run and long run constant. This technique has an advantage as it isolates the speed of adjustment parameter which indicates how quickly the system returns to equilibrium after a random shock.

Table 5.10 Results of ECM for GDP

Variable	Coefficient	Standard Error	t-Statistic
D(RGDPBO)	0.005	0.005826	1.024468
D(RGDPLE)	-0.097	0.054892	-1.767624
D(RGDPNA)	1.51	1.28	1.174618
D(RGDPSW)	0.146	0.046327	3.168927
ECM(-1)	-0.457	0.102763	-4.454011
C	0.0202	0.010560	1.920373
t-ratio of estimates,* and ** denote a t-ratio significant at the 1% and 5% respectively. ECM TERM : -0.457 P-value =0.0001			

The error correction term is negative (-0.457) and significant . This shows that there is speed of adjustment of 0.46% of GDP in South Africa.. All variables are statistically significant at 5% level in explaining GDP in SA.

A 1% increase in economic growth in Namibia will lead to an 8.31% positive change in GDP in SA, GDP in Lesotho will lead to -1.70% decline, while GDP in Botswana shows 1.01% and GDP Swaziland leads by 6.87%. The results show a positive GDP in SA, while the theory say increase in the gross domestic product can trigger greater productivity and better the economy, therefore, creating more growth in an upward spiral cycle, negative growth is the opposite. By fostering specialization and the transfer of technology, leading directly to faster economic growth and improved standards of living.

The ECM (-1) is positive and non-significant. This term distinguish the long run relationship. It reflects attempts to correct deviation from the long-run equilibrium path. Its coefficient is interpreted as the speed of adjustment or the amount of disequilibrium transmitted each period to economic growth. Its magnitude is 0.285 implying that about 28% of disequilibrium is corrected in subsequent period.

Table 5.11 Results of ECM for Exchange Rates

Variable	Coefficient	Standard Error	t-Statistic
D(XRATEBO(-1))	-15.42856	8.697503	-1.773907
D(XRATESW(-1))	-1.527659	1.185899	-1.288187
D(XTRATENA(-1))	3.899807	4.418879	0.882533
D(XRATELE(-1))	0.338474	0.178489	1.896327
ECM-1	-1.064050	4.319791	-0.246320
C	0.652172	4.751143	0.137266
t-ratio of estimates,* and ** denote a t-ratio significant at the 1% and 5% respectively. ECM TERM= -0.77 P-Value= 0.003			

The error correction term is negative and statistically significant. This indicates that there is speed of adjustment of 1.06% explained by exchange rate in SACU region. The model explains 1% of exchange rate in Swaziland meaning that there are other significant variables that explains changes in EXR in Swaziland. All variables are statistically significant at 5% level in explaining exchange rate in Swaziland.

A 1% increase in exchange rate in Namibia will lead to an 1% positive change, EXRATE in SA will lead to -5.97% decline, while EXRATE in Lesotho shows -1.13%, Namibia 1% and exchange rate in Botswana leads by -6.30%. Thus, the results are different from the theory, finding that an decrease in exchange rate, that is, When there is a decline and the exchange rate goes down, the exports of a country will be cheaper and imports will become more expensive, e.g. a decline of the dollar makes US exports more competitive. Therefore there will be a raise in exports and diminish in quantity of imports. Therefore, domestic firms will benefit from bigger sales. It may lead to job creation and lower unemployment, especially in exporting industries. The boost in X-M will help raise Aggregate Demand (AD) and as a result, lead to higher economic growth.

The ECM (-1) is positive and non-significant. This term distinguish the long run relationship. It reflects attempts to correct deviation from the long-run equilibrium path. Its coefficient is interpreted as the speed of adjustment or the amount of disequilibrium transmitted each period to economic growth. Its magnitude is 0.77 implying that about 77% of disequilibrium is corrected in subsequent period

Table 5.12 Results of ECM for inflation rates (CPI)

Variable	Coefficient	Standard Error	t-Statistic
Dlog(INFLANA)	-0.102	0.093	1.102**
Dlog(INFLALE)	0.31	0.065	0.475**
Dlog(INFLABO)	0.17	0.249	0.686**
Dlog(INFLASW)	0.199	0.153	1.297**
ECM(-1)	-0.099	0.069	1.429
C	6.40	0.605	10.57

t-ratio of estimates,* and ** denote a t-ratio significant at the 1% and 5% respectively.

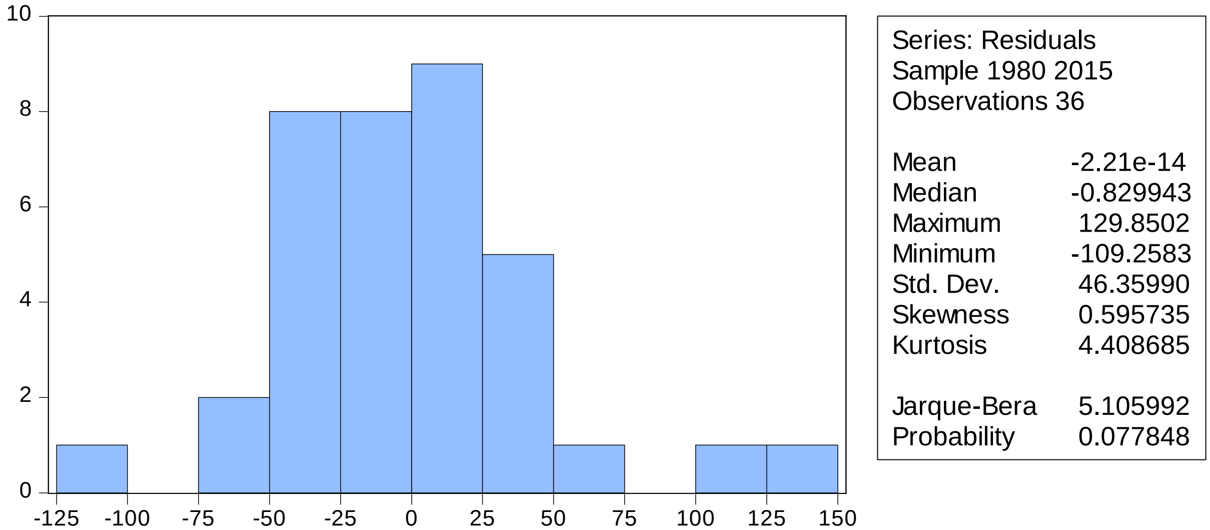
ECM TERM=-0.099 P-value= 0.0001

The error correction term is negative and statistically significant. This indicates that there is speed of adjustment of 0.099% explained by inflation in the region. Therefore the model explains 15% of inflation rate in SA meaning that there are other significant variables that explains changes in INFLA in SA. All variables are statistically significant at 5% level in explaining INFLA in SA.

A 1% increase in inflation in SA will lead to a 1% positive change, INFLA in Namibia will lead to -0.102% decline, while INFLA in Lesotho shows 0.31%, Swaziland 0.199% and inflation rate in Botswana leads by 0.17%. Deflation is potentially very damaging to the economy and can lead to poorer consumer spending and lower growth. For example, when prices are declining, consumers are encouraged to delay purchasing. Moderate inflation rate reduce the real value of debt. If there is deflation, the real value of debt increases leading to a squeeze on disposable incomes. Moderate rates of inflation are sign of a healthy economy. With economic growth, usually get a degree of inflation and moderate prices.

The ECM (-1) is positive and non-significant. This term distinguish the long run relationship. It reflects attempts to correct deviation from the long-run equilibrium path. Its coefficient is interpreted as the speed of adjustment or the amount of disequilibrium transmitted each period to economic growth. Its magnitude is 0.099 implying that about 1% of disequilibrium is corrected in subsequent period.

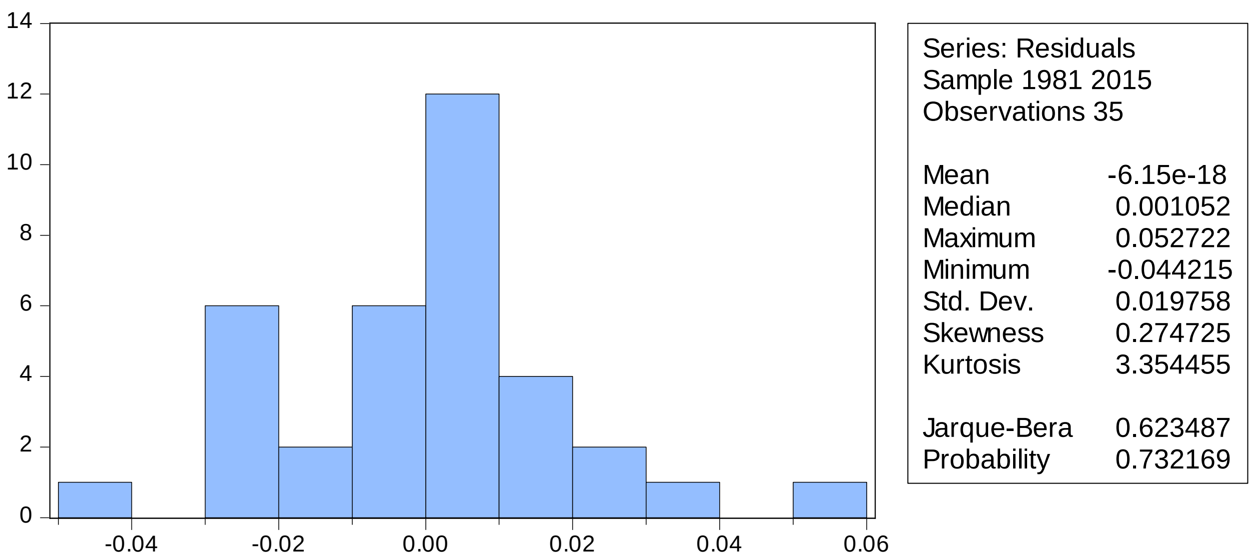
5.6 Diagnostic testing



Eviews 8 (2015)

Figure 5.3.1 Normality test on the residuals (GDP on five different countries)

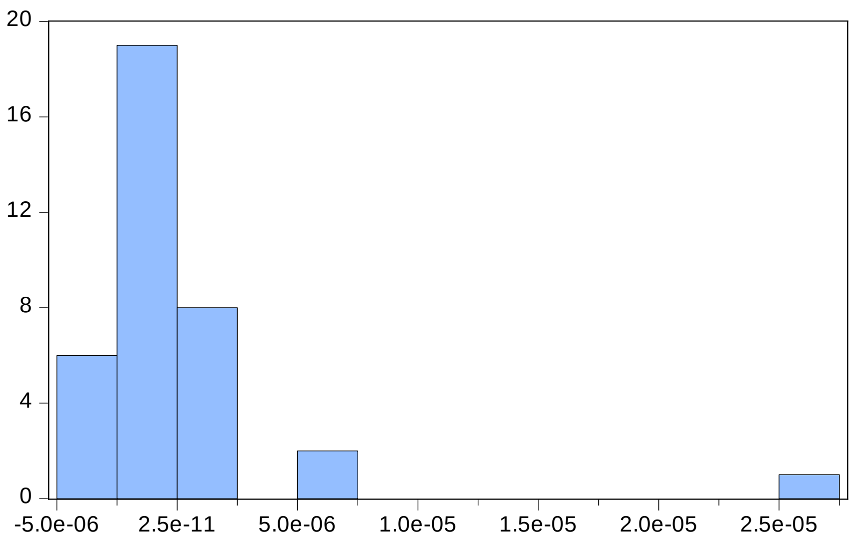
The *Jarque-Bera* test statistics test whether the residuals are normally distributed. The null hypothesis for the above figure 5.3.1 is that the residual are not normally distributed. The decision rule for the rest is that if P< 0.05 level of significance then the null hypothesis should be rejected. The result for the probability is 0.077848 which is more than the 0.05 level of signification; therefore the study rejects the null hypothesis. This means that the residuals are normally distributed for the present study.



Source: Eviews 8 (2015)

Figure 5.3.2 Normality test on the residuals (INF on five different countries)

The *Jarque-Bera* test statistics test whether the residuals are normally distributed. The null hypothesis for the above figure 5.3.2 is that the residual are not normally distributed. The decision rule for the rest is that if P< 0.05 level of significance then the null hypothesis should be rejected. The result for the probability is 0.732169 which is more than the 0.05 level of signification; therefore the study rejects the null hypothesis. This means that the residuals are normally distributed for the present study.



Series: Residuals	
Sample 1980 2015	
Observations 36	
Mean	4.07e-16
Median	-1.47e-06
Maximum	2.64e-05
Minimum	-3.85e-06
Std. Dev.	5.17e-06
Skewness	3.950056
Kurtosis	20.24315
Jarque-Bera	539.6072
Probability	0.000000

Figure 5.3.3 Normality test on the residuals (EXR on five different countries)

The *Jarque-Bera* test statistics test whether the residuals are normally distributed. The null hypothesis for the above figure 4.7.1 is that the residual are not normally distributed. The decision rule for the rest is that if P< 0.05 level of significance then the null hypothesis should be rejected. The result for the probability is 0.000 which is less than the 0.05 level of signification, therefore the study accept the null hypothesis. This means that the residuals are not normally distributed for the current study.

Table 5.13 Serial correlation test on the residuals (GDP)

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	3.041724	Prob.F (2.27)	0.0644
Obs*R-squared	6.435868	Prob. Chi-Square(4)	0.0400

The table 5.12 above outlines the results for the serial correlation on the residuals, from the output of *Breusch-Godfrey*. The null hypothesis of the study is that there is no serial correlation in the residuals. The probability value from the result is 0.0644 and 0.0400; in the case the null hypothesis is accepted. This means that there is no serial correlation in the residuals.

Table 5.14 Serial correlation test on the residuals (INF)

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.696895	Prob.F(4.31)	0.5999
Obs*R-squared	2.970113	Prob. Chi-Square(4)	0.5628

The table 5.13 above outlines the results for the serial correlation on the residuals, from the output of *Breusch-Godfrey*. The null hypothesis of the study is that there is no serial correlation in the residuals. The probability value from the result is 0.599 and 0.5628; in the case the null hypothesis is accepted. This means that there is no serial correlation in the residuals.

Table 5.15 Serial correlation test on the residuals (EXR)

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.657347	Prob. F(4.31)	0.6262
Obs*R-squared	2.314739	Prob. Chi-Square(4)	0.5893

The table 5.14 above outlines the results for the serial correlation on the residuals, from the output of *Breusch-Godfrey*. The null hypothesis of the study is that there is no serial correlation in the residuals. The probability value from the result is 0.6262 and 0.5893; in the case the null hypothesis is accepted. This means that there is no serial correlation in the residuals

Table 5.16 Heteroscedasticity test: ARCH (GDP)

HeteroscedasticityTest:ARCH			
F-statistic	78.99190	Prob. F(1.33)	0.0000
Obs*R-squared	24.68675	Prob. Chi-Square(1)	0.0000

Table 5.15 outlines the result of heteroscedasticity on the residuals, from the output of heteroscedasticity test: ARCH the study test the null hypothesis that there is no heteroscedasticity up to order q in the residual. The probability value from the result is 0.0000; the study rejects the null hypothesis. This means that for the current study there is heteroscedasticity up to order q in the residual.

Table 5.17 Heteroscedasticity test: ARCH (INF)

HeteroscedasticityTest:ARCH			
F-statistic	1.078287	Prob. F(1.33)	0.3066
Obs*R-squared	1.107451	Prob. Chi-Square(1)	0.2926

Table 5.16 outlines the result of heteroscedasticity on the residuals, from the output of heteroscedasticity test: ARCH the study test the null hypothesis that there is no heteroscedasticity up to order q in the residual. The probability value from the result is 0.3066 and 0.2926; the study accepts the null hypothesis. This means that for the current study there is no heteroscedasticity up to order q in the residual.

Table 5.18 Heteroscedasticity test: ARCH (EXR)

Heteroscedasticity Test: ARCH			
F-statistic	0.068142	Prob. F(1.33)	0.7957
Obs*R-squared	0.072122	Prob. Chi-Square(1)	0.7883

Table 5.17 outlines the result of heteroscedasticity on the residuals, from the output of heteroscedasticity test: ARCH the study test the null hypothesis that there is no heteroscedasticity up to order q in the residual. The probability value from the result is 0.7957 and 0.7883; the study accepts the null hypothesis. This means that for the current study there is no heteroscedasticity up to order q in the residual.

Table 5.19 Ramsey reset test on residuals (GDP)

	Value	Df	Probability
F-Statistic	4.09E-05	(1.30)	0.9949
Likelihood ratio	4.91E-05	1	0.9944

The Ramsey reset test, also known as the regression specification error test is applied. The p-value from the results is 0.9949 and 0.9944 which are more than the critical p-value=0,05, therefore, the null hypothesis of the mis-specification in the model is accepted. This means that the model is statistically well specified and that the residual is normally distributed.

Table 5.20 Ramsey reset test on residuals (INF)

	Value	Df	Probability
F-Statistic	0.051673	(1.30)	0.8217
Likelihood ratio	0.061954	1	0.8034

The Ramsey reset test, also known as the regression specification error test is applied. The p-value from the results is 0.8217 and 0.8034 which are more than the critical p-value=0,05, therefore, the null hypothesis of the mis-specification in the model is accepted. This means that the model is statistically well specified and that the residual is normally distributed.

Table 5.21 Ramsey reset test on residuals (EXR)

	Value	Df	Probability
F-Statistic	0.084175	(1.30)	07737
Likelihood ratio	0.100868	1	0.7508

The Ramsey reset test, also known as the regression specification error test is applied. The p-value from the results is 0.7737 and 0.7508 which are more than the critical p-value=0,05, therefore, the null hypothesis of the mis-specification in the model is accepted. This means that the model is statistically well specified and that the residual is normally distributed.

5.7 Conclusion

Co- integration test determines that there is a long-run relationship between changes in exchange rate, inflation (CPI) and GDP. The result suggests that the variables under consideration are cointegrated and hence, share a common linear common trend, that is, they move together in the long-run. The study objectives and questions were answered in the ECM for the long-run relationship of the models used.

CHAPTER 6

IMPLICATIONS, RECOMMENDATIONS AND CONCLUSIONS

6.1 Implications and Recommendations

Inflation is one of the most important criteria for a regional bloc to be an optimum currency area. Given this, all SACU members' inflation rates look similar and the swing are in the same direction. It is for this that SACU can be an optimum currency area and can have a common currency on trade for this region to flourish economically.

The pattern of growth rates are the same and have been showing a positive growth rate except only when there was a global economic meltdown experienced in 2010. This is testimony that SACU can be an optimum currency area. The positive relationship between inflation and exchange rates work favourably for SACU to seriously consider this bloc to be an optimum currency area in future. The member states share a common linear common trend as they are cointegrated with regard to inflation, GDP and exchange rates. The study may help the policy makers and governments to formulate economic policies consistent with the economic conditions of the SACU countries.

6.2 Conclusions

The purpose of this research using *EXRt* framework was to investigate if SACU can be an optimum currency area. The data used in this study is integrated of order at A (0) and A (1). The data is stable and serially correlated. Thus the cointegration results show the long-run relationship of the variables among the SACU region. The ECM was applied to determine the short run effects of exchange rate, inflation (CPI) and GDP in different countries. Thus the error correction terms are negative and significant in all cases. Under GDP the speed of adjustment has seen to be 0.46%, for inflation rate is 0.099% and for that of exchange rate is 1.064%. Thus A country's costs and benefits from joining a currency union depend on how closely integrated its economy is with those of its potential partners. The traditional theory of optimum currency areas identified those specific characteristics that are relevant for choosing the likely participants in a currency union. The intensity of trade with other potential members of the currency union and the extent to which domestic business cycles are correlated with those of other countries are among the most important criteria. The more two countries trade with each other and the more similar their business cycles are, the better candidates they are for a currency union.

The research found that there is a relatively better macroeconomic convergence in all SACU members as there is cointegration as the swing patterns of all the variables as tested (inflation, GDP and exchange rates) are in the same direction. There is also a more or less same inflation rates (dependent variable) which is one of the most important criteria for a region to be regarded as optimum currency area.

The positive relationship between inflation, GDP and the exchange rates within the member states as shown by the graphs augers well for the possibility of SACU to be an optimum currency area. South Africa as the big economy in the member states will have to come to the rescue if any of the member states experiences some economic shocks, this can be modelled as in the Euro Zone, as is the case with Greece at the moment.

The fiscal cliff experienced in the US and the austerity measures taken in Europe are a good lesson for SACU to be contend with in the event of problems that can be encountered in SACU in future.

In chapter 5, it has been shown that SACU can be an optimum currency area. Given this, therefore, and needless to say that there is a positive-sum game (see the appendix).

The quantitative conclusion is that optimum currency area has a positive effect on the overall economic development for the member states. It would be wise for SACU to be an optimum currency area as the results lead to this conclusion.

The general conclusion is that EXRt hypothesis holds for SACU economies given stationarity series and cointegration within the system and the region is potentially an optimum currency area and can proceed with the formation of a single currency.

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APPENDICES

i. FORMULAS FOR THE CALCULATION OF REVENUE POOL IN SACU

SACU member states deposit their customs and excise collections in a common revenue pool which they share using a formula that has evolved over the years. According to the new RSF the total payment (P) to each SACU member country (*i*) is calculated from its share of three different components: $Pi = Ci + Ei + Di$

Where:

$$C_1 = \frac{M_i}{\sum_{i=1}^{i=n} M} * C \qquad (1)$$

$$E_i = \frac{GDP}{\sum_{i=1}^{I=n} GDP} * C \qquad (2)$$

$$D_1 = \left[1 - \left(\frac{GDPC_i}{\sum_{i=1}^{i=n} GDPC_1} \right) / 10 \right] * D/n = \left[11 - \left(\frac{GDPC_i}{\sum_{i=1}^{i=n} GDPC_i} \right) \right] * D/10n \qquad (3)$$

And:

C = total customs duties collected in SACU (the customs component)

E = total excise duties collected in SACU less D (the excise component)

D = a predetermined share (initially 15%) of total excise duties collected in

$GDPi$ = GDP on country i

Mi = total intra-SACU imports of country i

n = number of member countries in SACU (Kirk, Stern: 2003)

Under the 2002 revenue sharing formula, the BLNS countries together get nearly half of the collections although their joint gross domestic product is less than 10 percent of SACU GD

ii. Data

GDP					
YEAR	**GDPSA**	**GDPBO**	**GDPSW**	**GDPNA**	**GDPLE**
1980	935.617	12.02	-3.811	3.54E+09	5.62E+08
1981	985.773	8.154	14.641	3.57E+09	5.66E+08
1982	981.994	15.874	1.173	3.56E+09	5.8E+08
1983	963.861	10.793	1.202	3.49E+09	5.94E+08
1984	1013.009	6.517	6.162	3.49E+09	6.23E+08
1985	1000.737	7.695	3.792	3.5E+09	6.39E+08
1986	1000.915	8.616	12.264	3.67E+09	6.74E+08
1987	1021.942	14.89	14.607	3.8E+09	6.74E+08
1988	1064.864	23.42	6.57	3.83E+09	7.32E+08
1989	1090.366	4.665	12.912	3.9E+09	7.72E+08
1990	1086.901	8.787	9.752	3.98E+09	8.16E+08
1991	1075.833	6.237	1.757	4.31E+09	8.48E+08
1992	1052.842	-0.208	3.113	4.62E+09	9.09E+08
1993	1065.83	4.027	3.029	4.54E+09	9.39E+08
1994	1100.3	-0.786	2.398	4.62E+09	9.9E+08
1995	1134.582	8.004	4.914	4.8E+09	1.01E+09
1996	1183.445	4.438	3.441	4.96E+09	1.06E+09
1997	1214.768	9.729	3.29	5.17E+09	1.11E+09
1998	1221.053	10.366	2.741	5.34E+09	1.12E+09
1999	1249.847	9.841	2.734	5.52E+09	1.13E+09
2000	1301.773	5.887	2.039	5.71E+09	1.19E+09
2001	1337.382	3.495	0.916	5.78E+09	1.24E+09
2002	1386.435	8.955	1.818	6.05E+09	1.24E+09
2003	1427.322	6.309	3.871	6.31E+09	1.3E+09
2004	1492.33	5.95	2.311	7.08E+09	1.33E+09

2005	1571.082	1.635	2.151	7.26E+09	1.37E+09
2006	1659.121	5.123	2.904	7.77E+09	1.43E+09
2007	1751.165	4.806	2.805	8.29E+09	1.49E+09
2008	1814.594	2.971	3.063	8.51E+09	1.58E+09
2009	1786.9	-4.748	1.173	8.53E+09	1.63E+09
2010	1843.008	7.015	1.861	9.05E+09	1.75E+09
2011	1909.343	5.088	0.271	9.51E+09	1.8E+09
2012	1956.444	3.822	-1.494	1E+10	1.92E+09
2013	1993.433	4.139	-0.005	1.05E+10	2.02E+09
2014	2021.323	4.191	0.309	9.32E+09	1.83E+09
2015	2067.81	4.332	0.32	9.53E+09	1.87E+09

XTRATE				
XRATESA	**XRATEBO**	**XRATESW**	**XTRATENA**	**XRATELE**
153.7041	0.777225	0.950663	0.950663	195.3341
161.7131	0.836738	1.11341	1.11341	191.1349
153.2116	1.029661	1.18729	1.18729	186.9541
168.6297	1.096926	1.27926	1.27926	196.785
148.74	1.298373	1.94563	1.94563	194.6333
112.9631	1.902567	2.80926	2.80926	187.1874
104.2816	1.879144	2.67072	2.67072	185.7065
117.6997	1.678941	2.73793	2.73793	179.3132
111.1548	1.828588	3.19971	3.19971	177.0065
111.6056	2.014886	3.33272	3.33272	177.4498
114.7431	1.860466	3.6456	3.64557	173.1639
119.4255	2.021557	3.92372	3.92371	185.0107
123.3929	2.109725	4.19788	4.19787	198.5408
121.098	2.423075	4.66667	4.66667	198.25
115.9197	2.684645	5.17298	5.17298	189.0616
112.674	2.772207	5.42197	5.42197	189.3407
103.7249	3.324197	6.73325	6.73325	171.3781
109.5298	3.650763	6.56747	6.56747	171.6039
100.5733	4.22588	8.25106	8.25106	157.5805
95.15425	4.624395	8.44711	8.44711	142.3245
92.06263	5.101816	9.86107	9.86107	136.8678
81.30614	5.841159	15.2397	15.2397	118.2402
69.46051	6.327801	11.7463	11.7463	54.10962
90.23766	4.949929	9.86684	9.86684	77.71898
97.57171	4.692887	8.74345	8.74345	91.5391
98.89669	5.110354	9.04013	9.04013	94.04328
94.95092	5.836571	10.4857	10.4857	91.9191

89.26601	6.138819	10.7615	10.7615	90.75242
79.43451	6.826857	14.3322	14.3322	82.47652
86.58106	7.155138	11.5696	11.5696	87.78323
100	6.7640159	10.2129	10.2129	100
103.2666	6.9810033	12.5016	12.5016	99.87667
94.73425	7.1979908	13.0656	13.0656	94.38162
82.72779	7.4149783	16.1544	16.1544	84.67154
77.61954	7.6319658	16.7786	16.7786	79.13399
73.53066	7.8489533	15.205971	15.20597	69.01231

INFL				
INFLSA	**INFLBO**	**INFLSW**	**INFLNA**	**INFLLE**
10.8	12.127	18.2	0	16.27484
12.5	16.3	20.056	3.548617	12.41326
14.3	11.2	10.807	17.01049	12.13992
16.1	10.5	11.568	13.35269	17.49235
17.9	8.6	12.94	12.74901	10.98386
20.8	8.1	20.463	23.92523	13.32083
24.7	10	13.737	10.0332	18.00497
28.7	9.8	13.377	9.427639	11.75026
32.4	8.4	20.395	20.16546	11.45637
37.1	11.6	7.546	15.09741	14.72825
42.4	11.4	13.092	6.4255	11.63476
49	12.6	8.934	5.999236	17.6781
55.7	16.5	7.558	10.28864	17.20852
61.2	14.4	12.023	8.654846	17.20852
66.6	10.6	13.769	20.69416	17.20852
72.4	10.5	12.289	6.583546	17.20852
77.7	10.1	6.425	14.95034	17.20852
84.4	8.9	7.945	6.940705	17.20852
90.2	6.51	7.51	8.331488	17.20852
94.9	7.816	5.862	6.699456	17.20852
100	8.534	7.2	12.33558	6.131975
105.7	6.565	5.942	11.25937	-9.61615
115.4	8.026	12.02	10.7283	33.81258
122.1	9.185	7.29	1.006712	6.629164
123.8	6.988	3.445	1.903992	5.023421
128	8.61	1.751	5.52868	3.437884
134	11.553	5.2	9.272906	6.072719
143.5	7.077	8.076	6.91031	8.012437
160.055	12.623	12.657	10.90857	10.71567

171.467	8.108	7.448	6.961897	7.379439
178.767	6.95	4.509	3.564591	3.597811
187.706	8.464	6.107	3.801813	5.024817
198.318	7.533	8.94	12.94024	6.103593
209.724	7.227	8.125	12.51806	4.928341
222.943	6.877	6.106	6.35213	5.340362
201.3903	6.627	4.999	6.136624	5.789875

Unit root test

Null Hypothesis: GDPSA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.036367	0.9255
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSA)
Method: Least Squares
Date: 05/17/15 Time: 18:57
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPSA(-1)	-0.044562	0.042998	-1.036367	0.3078
C	38.87733	33.44300	1.162495	0.2536
@TREND("1980")	2.940239	1.478205	1.989060	0.0553

R-squared	0.264907	Mean dependent var	32.34837
Adjusted R-squared	0.218964	S.D. dependent var	31.02416
S.E. of regression	27.41799	Akaike info criterion	9.542092
Sum squared resid	24055.88	Schwarz criterion	9.675408
Log likelihood	-163.9866	Hannan-Quinn criter.	9.588113
F-statistic	5.765949	Durbin-Watson stat	1.448230
Prob(F-statistic)	0.007269		

Null Hypothesis: GDPSA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.636792	1.0000
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSA)
Method: Least Squares
Date: 05/17/15 Time: 18:57
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPSA(-1)	0.036739	0.013933	2.636792	0.0127
C	-16.66737	19.20832	-0.867716	0.3918

R-squared	0.174023	Mean dependent var	32.34837
Adjusted R-squared	0.148993	S.D. dependent var	31.02416
S.E. of regression	28.61980	Akaike info criterion	9.601520
Sum squared resid	27030.06	Schwarz criterion	9.690397
Log likelihood	-166.0266	Hannan-Quinn criter.	9.632200
F-statistic	6.952671	Durbin-Watson stat	1.396422
Prob(F-statistic)	0.012661		

Null Hypothesis: GDPSA has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	7.161427	1.0000
Test critical values: 1% level	-2.632688	
5% level	-1.950687	
10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSA)
Method: Least Squares
Date: 05/17/15 Time: 18:58
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPSA(-1)	0.025038	0.003496	7.161427	0.0000

R-squared	0.155177	Mean dependent var	32.34837
Adjusted R-squared	0.155177	S.D. dependent var	31.02416
S.E. of regression	28.51562	Akaike info criterion	9.566937
Sum squared resid	27646.78	Schwarz criterion	9.611375
Log likelihood	-166.4214	Hannan-Quinn criter.	9.582277
Durbin-Watson stat	1.347999		

1st difference

Null Hypothesis: D(GDPSA) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.607508	0.0042
Test critical values: 1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSA,2)
Method: Least Squares
Date: 05/17/15 Time: 18:59
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPSA(-1))	-0.771552	0.167455	-4.607508	0.0001
C	-0.658803	9.655226	-0.068233	0.9460
@TREND("1980")	1.361540	0.527872	2.579298	0.0149

R-squared	0.408023	Mean dependent var	-0.107912
Adjusted R-squared	0.369831	S.D. dependent var	33.16961
S.E. of regression	26.33110	Akaike info criterion	9.463476
Sum squared resid	21493.13	Schwarz criterion	9.598155
Log likelihood	-157.8791	Hannan-Quinn criter.	9.509405
F-statistic	10.68344	Durbin-Watson stat	1.812116
Prob(F-statistic)	0.000296		

Null Hypothesis: D(GDPSA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.536253	0.0129
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSA,2)
Method: Least Squares
Date: 05/17/15 Time: 18:59
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPSA(-1))	-0.560101	0.158388	-3.536253	0.0013
C	17.77752	7.040943	2.524878	0.0167

R-squared	0.280981	Mean dependent var	-0.107912
Adjusted R-squared	0.258512	S.D. dependent var	33.16961
S.E. of regression	28.56226	Akaike info criterion	9.599072
Sum squared resid	26105.68	Schwarz criterion	9.688858
Log likelihood	-161.1842	Hannan-Quinn criter.	9.629691
F-statistic	12.50509	Durbin-Watson stat	1.823432
Prob(F-statistic)	0.001262		

Null Hypothesis: D(GDPSA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.296058	0.0229
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:01
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPSA(-1))	-0.272832	0.118826	-2.296058	0.0282

R-squared	0.137739	Mean dependent var	-0.107912
Adjusted R-squared	0.137739	S.D. dependent var	33.16961
S.E. of regression	30.80064	Akaike info criterion	9.721919

Sum squared resid	31306.43	Schwarz criterion	9.766812
Log likelihood	-164.2726	Hannan-Quinn criter.	9.737229
Durbin-Watson stat	2.056742		

Level

Null Hypothesis: GDPNA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.188218	0.4811
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPNA)
Method: Least Squares
Date: 05/17/15 Time: 19:03
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPNA(-1)	-0.170647	0.077984	-2.188218	0.0361
C	4.24E+08	1.94E+08	2.186174	0.0362
@TREND("1980")	41203261	16764917	2.457707	0.0196

R-squared	0.165704	Mean dependent var	1.71E+08
Adjusted R-squared	0.113560	S.D. dependent var	3.09E+08
S.E. of regression	2.91E+08	Akaike info criterion	41.89924
Sum squared resid	2.71E+18	Schwarz criterion	42.03255
Log likelihood	-730.2366	Hannan-Quinn criter.	41.94526
F-statistic	3.177840	Durbin-Watson stat	1.964282
Prob(F-statistic)	0.055097		

Null Hypothesis: GDPNA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.523039	0.9852
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPNA)
Method: Least Squares
Date: 05/17/15 Time: 19:04
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPNA(-1)	0.012734	0.024347	0.523039	0.6044
C	96915635	1.51E+08	0.640253	0.5264

R-squared	0.008222	Mean dependent var	1.71E+08
Adjusted R-squared	-0.021832	S.D. dependent var	3.09E+08
S.E. of regression	3.13E+08	Akaike info criterion	42.01501
Sum squared resid	3.23E+18	Schwarz criterion	42.10388
Log likelihood	-733.2626	Hannan-Quinn criter.	42.04569
F-statistic	0.273570	Durbin-Watson stat	1.982729
Prob(F-statistic)	0.604442		

Null Hypothesis: GDPNA has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		3.244038	0.9994
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPNA)
Method: Least Squares
Date: 05/17/15 Time: 19:04
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPNA(-1)	0.027341	0.008428	3.244038	0.0026

R-squared	-0.004098	Mean dependent var	1.71E+08
Adjusted R-squared	-0.004098	S.D. dependent var	3.09E+08
S.E. of regression	3.10E+08	Akaike info criterion	41.97021
Sum squared resid	3.27E+18	Schwarz criterion	42.01465
Log likelihood	-733.4786	Hannan-Quinn criter.	41.98555
Durbin-Watson stat	1.987223		

FIRST

Null Hypothesis: D(GDPNA) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.636711	0.0003
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPNA,2)

Method: Least Squares
Date: 05/17/15 Time: 19:09
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPNA(-1))	-1.012972	0.179710	-5.636711	0.0000
C	66131123	1.16E+08	0.567798	0.5743
@TREND("1980")	6010835.	5665849.	1.060889	0.2969

R-squared	0.506230	Mean dependent var	5038307.
Adjusted R-squared	0.474373	S.D. dependent var	4.38E+08
S.E. of regression	3.17E+08	Akaike info criterion	42.07215
Sum squared resid	3.12E+18	Schwarz criterion	42.20683
Log likelihood	-712.2266	Hannan-Quinn criter.	42.11808
F-statistic	15.89111	Durbin-Watson stat	1.998939
Prob(F-statistic)	0.000018		

Null Hypothesis: D(GDPNA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.526027	0.0001
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPNA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:09
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPNA(-1))	-0.973829	0.176226	-5.526027	0.0000
C	1.71E+08	62206004	2.743687	0.0099

R-squared	0.488303	Mean dependent var	5038307.
Adjusted R-squared	0.472312	S.D. dependent var	4.38E+08
S.E. of regression	3.18E+08	Akaike info criterion	42.04899
Sum squared resid	3.23E+18	Schwarz criterion	42.13878
Log likelihood	-712.8328	Hannan-Quinn criter.	42.07961
F-statistic	30.53698	Durbin-Watson stat	2.004662
Prob(F-statistic)	0.000004		

Null Hypothesis: D(GDPNA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.383657	0.0001
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPNA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:10
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPNA(-1))	-0.740853	0.169003	-4.383657	0.0001

R-squared	0.367929	Mean dependent var	5038307.
Adjusted R-squared	0.367929	S.D. dependent var	4.38E+08
S.E. of regression	3.48E+08	Akaike info criterion	42.20144
Sum squared resid	3.99E+18	Schwarz criterion	42.24633
Log likelihood	-716.4244	Hannan-Quinn criter.	42.21675
Durbin-Watson stat	2.055275		

LEVEL

Null Hypothesis: GDPLE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.408643	0.9805
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPLE)
Method: Least Squares
Date: 05/17/15 Time: 19:16
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPLE(-1)	0.008125	0.019883	0.408643	0.6854
C	28270298	23960338	1.179879	0.2465

R-squared	0.005035	Mean dependent var	37434530
Adjusted R-squared	-0.025116	S.D. dependent var	49294510
S.E. of regression	49909703	Akaike info criterion	38.34477
Sum squared resid	8.22E+16	Schwarz criterion	38.43365
Log likelihood	-669.0335	Hannan-Quinn criter.	38.37545
F-statistic	0.166989	Durbin-Watson stat	2.153955
Prob(F-statistic)	0.685442		

Null Hypothesis: GDPLE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.514295	0.3198

Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPLE)
Method: Least Squares
Date: 05/17/15 Time: 19:17
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPLE(-1)	-0.261693	0.104082	-2.514295	0.0172
C	1.25E+08	42953645	2.917780	0.0064
@TREND("1980")	11515022	4372676.	2.633404	0.0129

R-squared	0.182252	Mean dependent var	37434530
Adjusted R-squared	0.131142	S.D. dependent var	49294510
S.E. of regression	45948664	Akaike info criterion	38.20576
Sum squared resid	6.76E+16	Schwarz criterion	38.33908
Log likelihood	-665.6009	Hannan-Quinn criter.	38.25178
F-statistic	3.565919	Durbin-Watson stat	1.998444
Prob(F-statistic)	0.039987		

Null Hypothesis: GDPLE has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.272496	1.0000
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPLE)

Method: Least Squares
Date: 05/17/15 Time: 19:18
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPLE(-1)	0.030082	0.007041	4.272496	0.0001

R-squared	-0.036938	Mean dependent var	37434530
Adjusted R-squared	-0.036938	S.D. dependent var	49294510
S.E. of regression	50196677	Akaike info criterion	38.32895
Sum squared resid	8.57E+16	Schwarz criterion	38.37339
Log likelihood	-669.7566	Hannan-Quinn criter.	38.34429
Durbin-Watson stat	2.112622		

FIRST

Null Hypothesis: D(GDPLE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.101704	0.0001
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPLE,2)
Method: Least Squares
Date: 05/17/15 Time: 19:18
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPLE(-1))	-1.088450	0.178385	-6.101704	0.0000
C	29867802	19042485	1.568482	0.1269
@TREND("1980")	640744.1	896218.2	0.714942	0.4800

R-squared	0.545872	Mean dependent var	1101536.
Adjusted R-squared	0.516573	S.D. dependent var	72946001
S.E. of regression	50718544	Akaike info criterion	38.40558
Sum squared resid	7.97E+16	Schwarz criterion	38.54026
Log likelihood	-649.8948	Hannan-Quinn criter.	38.45151
F-statistic	18.63134	Durbin-Watson stat	2.015844
Prob(F-statistic)	0.000005		

Null Hypothesis: D(GDPLE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.109149	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPLE,2)
Method: Least Squares
Date: 05/17/15 Time: 19:19
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPLE(-1))	-1.069814	0.175117	-6.109149	0.0000
C	41026093	10826407	3.789447	0.0006

R-squared	0.538384	Mean dependent var	1101536.
Adjusted R-squared	0.523959	S.D. dependent var	72946001
S.E. of regression	50329645	Akaike info criterion	38.36311
Sum squared resid	8.11E+16	Schwarz criterion	38.45290
Log likelihood	-650.1729	Hannan-Quinn criter.	38.39373
F-statistic	37.32170	Durbin-Watson stat	2.019585
Prob(F-statistic)	0.000001		

Null Hypothesis: D(GDPLE) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.044292	0.0002
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPLE,2)
Method: Least Squares
Date: 05/17/15 Time: 19:20
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPLE(-1))	-0.669244	0.165479	-4.044292	0.0003

R-squared	0.331235	Mean dependent var	1101536.
Adjusted R-squared	0.331235	S.D. dependent var	72946001
S.E. of regression	59653807	Akaike info criterion	38.67498
Sum squared resid	1.17E+17	Schwarz criterion	38.71988
Log likelihood	-656.4747	Hannan-Quinn criter.	38.69029
Durbin-Watson stat	2.109172		

LEVEL

Null Hypothesis: GDPBO has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.954520	0.0016
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	

	10% level	-3.204699

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPBO)
Method: Least Squares
Date: 05/17/15 Time: 19:20
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPBO(-1)	-0.870248	0.175647	-4.954520	0.0000
C	9.371088	2.506718	3.738389	0.0007
@TREND("1980")	-0.204450	0.086136	-2.373555	0.0238

R-squared	0.434494	Mean dependent var	-0.219657
Adjusted R-squared	0.399150	S.D. dependent var	5.697769
S.E. of regression	4.416597	Akaike info criterion	5.890432
Sum squared resid	624.2024	Schwarz criterion	6.023748
Log likelihood	-100.0826	Hannan-Quinn criter.	5.936453
F-statistic	12.29327	Durbin-Watson stat	1.979731
Prob(F-statistic)	0.000109		

Null Hypothesis: GDPBO has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.076660	0.0032
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPBO)
Method: Least Squares
Date: 05/17/15 Time: 19:21

Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPBO(-1)	-0.656212	0.160968	-4.076660	0.0003
C	4.237282	1.353088	3.131564	0.0036

R-squared	0.334934	Mean dependent var	-0.219657
Adjusted R-squared	0.314781	S.D. dependent var	5.697769
S.E. of regression	4.716497	Akaike info criterion	5.995455
Sum squared resid	734.0965	Schwarz criterion	6.084332
Log likelihood	-102.9205	Hannan-Quinn criter.	6.026136
F-statistic	16.61916	Durbin-Watson stat	2.119496
Prob(F-statistic)	0.000271		

Null Hypothesis: GDPBO has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.339063	0.0207
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPBO)
Method: Least Squares
Date: 05/17/15 Time: 19:21
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPBO(-1)	-0.248919	0.106418	-2.339063	0.0253

R-squared	0.137295	Mean dependent var	-0.219657
Adjusted R-squared	0.137295	S.D. dependent var	5.697769
S.E. of regression	5.292197	Akaike info criterion	6.198499

Sum squared resid	952.2498	Schwarz criterion	6.242938
Log likelihood	-107.4737	Hannan-Quinn criter.	6.213839
Durbin-Watson stat	2.568056		

FIRST

Null Hypothesis: D(GDPBO) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.016498	0.0000
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPBO,2)
Method: Least Squares
Date: 05/17/15 Time: 19:23
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPBO(-1))	-1.442001	0.159929	-9.016498	0.0000
C	-0.263921	1.945880	-0.135631	0.8930
@TREND("1980")	0.002688	0.092876	0.028944	0.9771

R-squared	0.724035	Mean dependent var	0.117853
Adjusted R-squared	0.706231	S.D. dependent var	9.799754
S.E. of regression	5.311515	Akaike info criterion	6.261728
Sum squared resid	874.5778	Schwarz criterion	6.396407
Log likelihood	-103.4494	Hannan-Quinn criter.	6.307658
F-statistic	40.66652	Durbin-Watson stat	2.108759
Prob(F-statistic)	0.000000		

Null Hypothesis: D(GDPBO) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.162617	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPBO,2)
Method: Least Squares
Date: 05/17/15 Time: 19:23
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPBO(-1))	-1.441889	0.157366	-9.162617	0.0000
C	-0.214163	0.897315	-0.238671	0.8129

R-squared	0.724027	Mean dependent var	0.117853
Adjusted R-squared	0.715403	S.D. dependent var	9.799754
S.E. of regression	5.227934	Akaike info criterion	6.202932
Sum squared resid	874.6015	Schwarz criterion	6.292718
Log likelihood	-103.4498	Hannan-Quinn criter.	6.233551
F-statistic	83.95355	Durbin-Watson stat	2.108831
Prob(F-statistic)	0.000000		

Null Hypothesis: D(GDPBO) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.294214	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	

	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPBO,2)
Method: Least Squares
Date: 05/17/15 Time: 19:24
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPBO(-1))	-1.440372	0.154975	-9.294214	0.0000

R-squared	0.723536	Mean dependent var	0.117853
Adjusted R-squared	0.723536	S.D. dependent var	9.799754
S.E. of regression	5.152694	Akaike info criterion	6.145887
Sum squared resid	876.1584	Schwarz criterion	6.190780
Log likelihood	-103.4801	Hannan-Quinn criter.	6.161197
Durbin-Watson stat	2.107333		

LEVEL

Null Hypothesis: GDPSW has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.635619	0.0000
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSW)
Method: Least Squares
Date: 05/17/15 Time: 19:25
Sample (adjusted): 1981 2015

Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPSW(-1)	-0.998624	0.150494	-6.635619	0.0000
C	8.365691	1.582123	5.287636	0.0000
@TREND("1980")	-0.251070	0.062748	-4.001274	0.0003

R-squared	0.584391	Mean dependent var	0.118029
Adjusted R-squared	0.558416	S.D. dependent var	4.972061
S.E. of regression	3.304025	Akaike info criterion	5.309976
Sum squared resid	349.3306	Schwarz criterion	5.443292
Log likelihood	-89.92458	Hannan-Quinn criter.	5.355997
F-statistic	22.49774	Durbin-Watson stat	1.421116
Prob(F-statistic)	0.000001		

Null Hypothesis: GDPSW has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.463536	0.0011
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSW)
Method: Least Squares
Date: 05/17/15 Time: 19:25
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPSW(-1)	-0.714039	0.159972	-4.463536	0.0001
C	2.783924	0.900274	3.092308	0.0040

R-squared	0.376454	Mean dependent var	0.118029
Adjusted R-squared	0.357559	S.D. dependent var	4.972061

S.E. of regression	3.985227	Akaike info criterion	5.658511
Sum squared resid	524.1072	Schwarz criterion	5.747388
Log likelihood	-97.02394	Hannan-Quinn criter.	5.689191
F-statistic	19.92316	Durbin-Watson stat	1.462713
Prob(F-statistic)	0.000089		

Null Hypothesis: GDPSW has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.881147	0.0052
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSW)
Method: Least Squares
Date: 05/17/15 Time: 19:26
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPSW(-1)	-0.385857	0.133925	-2.881147	0.0068

R-squared	0.195770	Mean dependent var	0.118029
Adjusted R-squared	0.195770	S.D. dependent var	4.972061
S.E. of regression	4.458887	Akaike info criterion	5.855831
Sum squared resid	675.9770	Schwarz criterion	5.900269
Log likelihood	-101.4770	Hannan-Quinn criter.	5.871171
Durbin-Watson stat	1.836587		

Null Hypothesis: D(GDPSW) has a unit root

Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.97929	0.0000
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSW,2)
Method: Least Squares
Date: 05/17/15 Time: 19:26
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPSW(-1))	-1.404945	0.117281	-11.97929	0.0000
C	-0.650722	1.244351	-0.522941	0.6047
@TREND("1980")	0.015059	0.059438	0.253353	0.8017

R-squared	0.825085	Mean dependent var	-0.542382
Adjusted R-squared	0.813800	S.D. dependent var	7.826778
S.E. of regression	3.377321	Akaike info criterion	5.356140
Sum squared resid	353.5952	Schwarz criterion	5.490819
Log likelihood	-88.05438	Hannan-Quinn criter.	5.402069
F-statistic	73.11461	Durbin-Watson stat	1.917446
Prob(F-statistic)	0.000000		

Null Hypothesis: D(GDPSW) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.27063	0.0000
Test critical values:	1% level	-3.639407	

5% level	-2.951125	
10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSW,2)
Method: Least Squares
Date: 05/17/15 Time: 19:27
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPSW(-1))	-1.408384	0.114777	-12.27063	0.0000
C	-0.371719	0.570843	-0.651176	0.5196

R-squared	0.824723	Mean dependent var	-0.542382
Adjusted R-squared	0.819246	S.D. dependent var	7.826778
S.E. of regression	3.327571	Akaike info criterion	5.299385
Sum squared resid	354.3273	Schwarz criterion	5.389171
Log likelihood	-88.08954	Hannan-Quinn criter.	5.330004
F-statistic	150.5683	Durbin-Watson stat	1.914020
Prob(F-statistic)	0.000000		

Null Hypothesis: D(GDPSW) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.39882	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPSW,2)

Method: Least Squares
Date: 05/17/15 Time: 19:28
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPSW(-1))	-1.410205	0.113737	-12.39882	0.0000

R-squared	0.822401	Mean dependent var	-0.542382
Adjusted R-squared	0.822401	S.D. dependent var	7.826778
S.E. of regression	3.298404	Akaike info criterion	5.253725
Sum squared resid	359.0225	Schwarz criterion	5.298618
Log likelihood	-88.31333	Hannan-Quinn criter.	5.269035
Durbin-Watson stat	1.889062		

D(XRATEBO(-1))	-6.30E-06	3.61E-06	-1.744302	0.0921
ECM(-1)	0.773364	0.180696	4.279913	0.0002
C	4.92E-07	1.03E-06	0.478062	0.6363

R-squared	1.000000	Mean dependent var	0.465528
Adjusted R-squared	1.000000	S.D. dependent var	1.627556
S.E. of regression	5.24E-06	Akaike info criterion	-21.32089
Sum squared resid	7.69E-10	Schwarz criterion	-21.05153
Log likelihood	368.4551	Hannan-Quinn criter.	-21.22903
F-statistic	6.36E+11	Durbin-Watson stat	2.036260
Prob(F-statistic)	0.000000		

Dependent Variable: D(INFLSA(-1))
Method: Least Squares
Date: 05/19/15 Time: 21:01
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(INFLNA(-1))	-0.102978	0.093441	-1.102066	0.2798
D(INFLLE(-1))	0.031009	0.065208	0.475543	0.6381
D(INFLBO(-1))	0.170874	0.249076	0.686033	0.4983
D(INFLSW(-1))	0.199729	0.153961	1.297266	0.2051
ECM(-1)	0.099280	0.069436	1.429800	0.1638
C	6.401693	0.605607	10.57070	0.0000

R-squared	0.146296	Mean dependent var	6.239500
Adjusted R-squared	-0.006151	S.D. dependent var	3.489615
S.E. of regression	3.500331	Akaike info criterion	5.502377
Sum squared resid	343.0648	Schwarz criterion	5.771735
Log likelihood	-87.54041	Hannan-Quinn criter.	5.594236
F-statistic	0.959652	Durbin-Watson stat	0.525651
Prob(F-statistic)	0.458997		

Date: 05/19/15 Time: 20:50
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPNA(-1))	8.31E-08	3.70E-08	2.246972	0.0327
D(GDPLE(-1))	-1.70E-07	1.83E-07	-0.925868	0.3624
D(GDPBO(-1))	1.007259	0.967245	1.041369	0.3066
D(GDPSW(-1))	1.686785	1.088337	1.549874	0.1324
ECM(-1)	0.285392	0.200236	1.425277	0.1651
C	25.30751	6.571815	3.850917	0.0006

R-squared	0.253876	Mean dependent var	31.93253
Adjusted R-squared	0.120640	S.D. dependent var	31.39155
S.E. of regression	29.43718	Akaike info criterion	9.761179
Sum squared resid	24263.33	Schwarz criterion	10.03054
Log likelihood	-159.9400	Hannan-Quinn criter.	9.853038

F-statistic	1.905455	Durbin-Watson stat	1.172982
Prob(F-statistic)	0.125212		

Dependent Variable: D(XRATESW(-1))
Method: Least Squares
Date: 05/19/15 Time: 20:58
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XTRATENA(-1))	1.000001	6.85E-07	1460352.	0.0000
D(XRATESA(-1))	-5.97E-08	1.18E-07	-0.505842	0.6169
D(XRATELE(-1))	-1.13E-07	8.54E-08	-1.324751	0.1960

Null Hypothesis: INFLSA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.399531	0.3734
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSA)
Method: Least Squares
Date: 05/17/15 Time: 19:41
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLSA(-1)	-0.201061	0.083792	-2.399531	0.0224

C	-0.202121	2.396168	-0.084352	0.9333
@TREND("1980")	1.338617	0.518358	2.582418	0.0146

R-squared	0.186581	Mean dependent var	5.445436
Adjusted R-squared	0.135742	S.D. dependent var	5.821346
S.E. of regression	5.411841	Akaike info criterion	6.296872
Sum squared resid	937.2168	Schwarz criterion	6.430188
Log likelihood	-107.1953	Hannan-Quinn criter.	6.342893
F-statistic	3.670056	Durbin-Watson stat	1.372302
Prob(F-statistic)	0.036731		

Null Hypothesis: INFLSA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.756852	0.9918
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSA)
Method: Least Squares
Date: 05/17/15 Time: 19:41
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLSA(-1)	0.011995	0.015849	0.756852	0.4545
C	4.344839	1.759313	2.469623	0.0189

R-squared	0.017062	Mean dependent var	5.445436
Adjusted R-squared	-0.012724	S.D. dependent var	5.821346
S.E. of regression	5.858263	Akaike info criterion	6.429029
Sum squared resid	1132.535	Schwarz criterion	6.517906
Log likelihood	-110.5080	Hannan-Quinn criter.	6.459709

F-statistic	0.572825	Durbin-Watson stat	1.241934
Prob(F-statistic)	0.454509		

Null Hypothesis: INFLSA has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.635905	1.0000
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSA)
Method: Least Squares
Date: 05/17/15 Time: 19:42
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLSA(-1)	0.044348	0.009566	4.635905	0.0001

R-squared	-0.164604	Mean dependent var	5.445436
Adjusted R-squared	-0.164604	S.D. dependent var	5.821346
S.E. of regression	6.282210	Akaike info criterion	6.541476
Sum squared resid	1341.850	Schwarz criterion	6.585915
Log likelihood	-113.4758	Hannan-Quinn criter.	6.556816
Durbin-Watson stat	1.073056		

FIRST DIFFRENCE

Null Hypothesis: D(INFLSA) has a unit root

Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.308578	0.4183
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:42
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLSA(-1))	-1.069198	0.463142	-2.308578	0.0278
C	3.714502	2.259676	1.643820	0.1103
@TREND("1980")	0.122857	0.162296	0.756993	0.4548

R-squared	0.201425	Mean dependent var	-0.683904
Adjusted R-squared	0.149904	S.D. dependent var	6.464790
S.E. of regression	5.960579	Akaike info criterion	6.492310
Sum squared resid	1101.384	Schwarz criterion	6.626989
Log likelihood	-107.3693	Hannan-Quinn criter.	6.538239
F-statistic	3.909564	Durbin-Watson stat	1.266664
Prob(F-statistic)	0.030612		

Null Hypothesis: D(INFLSA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.709996	0.0828
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:44
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLSA(-1))	-0.800398	0.295350	-2.709996	0.0107
C	4.310178	2.104059	2.048506	0.0488

R-squared	0.186663	Mean dependent var	-0.683904
Adjusted R-squared	0.161246	S.D. dependent var	6.464790
S.E. of regression	5.920681	Akaike info criterion	6.451803
Sum squared resid	1121.743	Schwarz criterion	6.541588
Log likelihood	-107.6806	Hannan-Quinn criter.	6.482422
F-statistic	7.344077	Durbin-Watson stat	1.268087
Prob(F-statistic)	0.010722		

Null Hypothesis: D(INFLSA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.811996	0.0670
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:44

Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLSA(-1))	-0.270486	0.149275	-1.811996	0.0791

R-squared	0.080004	Mean dependent var	-0.683904
Adjusted R-squared	0.080004	S.D. dependent var	6.464790
S.E. of regression	6.200794	Akaike info criterion	6.516202
Sum squared resid	1268.845	Schwarz criterion	6.561095
Log likelihood	-109.7754	Hannan-Quinn criter.	6.531512
Durbin-Watson stat	1.235052		

LEVEL

Null Hypothesis: INFLNA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.654350	0.0003
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLNA)
Method: Least Squares
Date: 05/17/15 Time: 19:45
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLNA(-1)	-0.902872	0.159677	-5.654350	0.0000

C	12.48157	2.603777	4.793641	0.0000
@TREND("1980")	-0.200900	0.085964	-2.337030	0.0259

R-squared	0.504601	Mean dependent var	0.175332
Adjusted R-squared	0.473639	S.D. dependent var	6.797855
S.E. of regression	4.931894	Akaike info criterion	6.111140
Sum squared resid	778.3546	Schwarz criterion	6.244455
Log likelihood	-103.9449	Hannan-Quinn criter.	6.157160
F-statistic	16.29723	Durbin-Watson stat	2.171283
Prob(F-statistic)	0.000013		

Null Hypothesis: INFLNA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.888887	0.0003
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLNA)
Method: Least Squares
Date: 05/17/15 Time: 19:46
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLNA(-1)	-0.798644	0.163359	-4.888887	0.0000
C	7.862186	1.805847	4.353738	0.0001

R-squared	0.420048	Mean dependent var	0.175332
Adjusted R-squared	0.402473	S.D. dependent var	6.797855
S.E. of regression	5.254732	Akaike info criterion	6.211580
Sum squared resid	911.2030	Schwarz criterion	6.300457
Log likelihood	-106.7027	Hannan-Quinn criter.	6.242261
F-statistic	23.90122	Durbin-Watson stat	2.039549
Prob(F-statistic)	0.000026		

Null Hypothesis: INFLNA has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.806195	0.0678
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLNA)
Method: Least Squares
Date: 05/17/15 Time: 19:46
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLNA(-1)	-0.179398	0.099324	-1.806195	0.0797

R-squared	0.086926	Mean dependent var	0.175332
Adjusted R-squared	0.086926	S.D. dependent var	6.797855
S.E. of regression	6.495685	Akaike info criterion	6.608309
Sum squared resid	1434.594	Schwarz criterion	6.652747
Log likelihood	-114.6454	Hannan-Quinn criter.	6.623649
Durbin-Watson stat	2.492873		

FIRST DIFFERENCE

Null Hypothesis: D(INFLNA) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-8.354573	0.0000
Test critical values: 1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLNA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:47
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLNA(-1))	-1.383244	0.165567	-8.354573	0.0000
C	1.617639	2.402507	0.673313	0.5057
@TREND("1980")	-0.079455	0.114716	-0.692625	0.4937

R-squared	0.692516	Mean dependent var	-0.110709
Adjusted R-squared	0.672679	S.D. dependent var	11.41339
S.E. of regression	6.529826	Akaike info criterion	6.674735
Sum squared resid	1321.798	Schwarz criterion	6.809414
Log likelihood	-110.4705	Hannan-Quinn criter.	6.720664
F-statistic	34.90920	Durbin-Watson stat	2.111143
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLNA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-8.395514	0.0000
Test critical values: 1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLNA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:47
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLNA(-1))	-1.371828	0.163400	-8.395514	0.0000
C	0.145586	1.111135	0.131024	0.8966

R-squared	0.687758	Mean dependent var	-0.110709
Adjusted R-squared	0.678001	S.D. dependent var	11.41339
S.E. of regression	6.476526	Akaike info criterion	6.631268
Sum squared resid	1342.253	Schwarz criterion	6.721054
Log likelihood	-110.7316	Hannan-Quinn criter.	6.661888
F-statistic	70.48465	Durbin-Watson stat	2.098634
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLNA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.951125	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLNA,2)
Method: Least Squares
Date: 05/17/15 Time: 19:47
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLNA(-1))	-1.371240	0.160888	-8.522961	0.0000

R-squared	0.687591	Mean dependent var	-0.110709
Adjusted R-squared	0.687591	S.D. dependent var	11.41339
S.E. of regression	6.379353	Akaike info criterion	6.572981
Sum squared resid	1342.973	Schwarz criterion	6.617874
Log likelihood	-110.7407	Hannan-Quinn criter.	6.588291
Durbin-Watson stat	2.098446		

Level

Null Hypothesis: INFLLE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.606054	0.0000
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLLE)
Method: Least Squares
Date: 05/17/15 Time: 19:48
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLLE(-1)	-1.153542	0.174619	-6.606054	0.0000
C	20.00933	3.809022	5.253142	0.0000
@TREND("1980")	-0.380960	0.123694	-3.079850	0.0042

R-squared	0.576953	Mean dependent var	-0.299570
Adjusted R-squared	0.550513	S.D. dependent var	9.785429
S.E. of regression	6.560523	Akaike info criterion	6.681834
Sum squared resid	1377.295	Schwarz criterion	6.815150
Log likelihood	-113.9321	Hannan-Quinn criter.	6.727855
F-statistic	21.82089	Durbin-Watson stat	2.022281
Prob(F-statistic)	0.000001		

Null Hypothesis: INFLLE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.212479	0.0001
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLLE)
Method: Least Squares
Date: 05/17/15 Time: 19:49
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLLE(-1)	-0.905902	0.173795	-5.212479	0.0000
C	10.26428	2.377652	4.316982	0.0001

R-squared	0.451553	Mean dependent var	-0.299570
Adjusted R-squared	0.434934	S.D. dependent var	9.785429
S.E. of regression	7.355794	Akaike info criterion	6.884299
Sum squared resid	1785.554	Schwarz criterion	6.973176
Log likelihood	-118.4752	Hannan-Quinn criter.	6.914979
F-statistic	27.16994	Durbin-Watson stat	2.016195
Prob(F-statistic)	0.000010		

Null Hypothesis: INFLLE has a unit root
Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.378485	0.0188
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLLE)
Method: Least Squares
Date: 05/17/15 Time: 19:49
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLLE(-1)	-0.266393	0.112001	-2.378485	0.0231

R-squared	0.141825	Mean dependent var	-0.299570
Adjusted R-squared	0.141825	S.D. dependent var	9.785429
S.E. of regression	9.064999	Akaike info criterion	7.274874
Sum squared resid	2793.923	Schwarz criterion	7.319312
Log likelihood	-126.3103	Hannan-Quinn criter.	7.290214
Durbin-Watson stat	2.701998		

FIRST

Null Hypothesis: D(INFLLE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.14949	0.0000
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLLE,2)
Method: Least Squares
Date: 05/17/15 Time: 19:49
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLLE(-1))	-1.535183	0.151257	-10.14949	0.0000
C	0.170628	3.158894	0.054015	0.9573
@TREND("1980")	-0.029057	0.150854	-0.192615	0.8485

R-squared	0.768695	Mean dependent var	0.126797
Adjusted R-squared	0.753772	S.D. dependent var	17.39041
S.E. of regression	8.629358	Akaike info criterion	7.232315
Sum squared resid	2308.441	Schwarz criterion	7.366994
Log likelihood	-119.9493	Hannan-Quinn criter.	7.278244
F-statistic	51.51104	Durbin-Watson stat	2.512458
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLLE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.30437	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLLE,2)
Method: Least Squares
Date: 05/17/15 Time: 19:50
Sample (adjusted): 1982 2015

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLLE(-1))	-1.534916	0.148958	-10.30437	0.0000
C	-0.366836	1.458274	-0.251555	0.8030

R-squared	0.768418	Mean dependent var	0.126797
Adjusted R-squared	0.761181	S.D. dependent var	17.39041
S.E. of regression	8.498535	Akaike info criterion	7.174687
Sum squared resid	2311.203	Schwarz criterion	7.264473
Log likelihood	-119.9697	Hannan-Quinn criter.	7.205307
F-statistic	106.1800	Durbin-Watson stat	2.509649
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLLE) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.45106	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLLE,2)
Method: Least Squares
Date: 05/17/15 Time: 19:51
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLLE(-1))	-1.533685	0.146749	-10.45106	0.0000

R-squared	0.767960	Mean dependent var	0.126797
Adjusted R-squared	0.767960	S.D. dependent var	17.39041
S.E. of regression	8.377050	Akaike info criterion	7.117839
Sum squared resid	2315.774	Schwarz criterion	7.162732

Log likelihood	-120.0033	Hannan-Quinn criter.	7.133149
Durbin-Watson stat	2.506006		

LEVEL

Null Hypothesis: INFLBO has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.792730	0.0289
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLBO)
Method: Least Squares
Date: 05/17/15 Time: 19:52
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLBO(-1)	-0.621537	0.163876	-3.792730	0.0006
C	7.416192	2.114477	3.507341	0.0014
@TREND("1980")	-0.085039	0.041519	-2.048176	0.0488

R-squared	0.310200	Mean dependent var	-0.157143
Adjusted R-squared	0.267087	S.D. dependent var	2.469062
S.E. of regression	2.113772	Akaike info criterion	4.416641
Sum squared resid	142.9770	Schwarz criterion	4.549957
Log likelihood	-74.29122	Hannan-Quinn criter.	4.462662
F-statistic	7.195128	Durbin-Watson stat	1.959624
Prob(F-statistic)	0.002628		

Null Hypothesis: INFLBO has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.048815	0.0401
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLBO)
Method: Least Squares
Date: 05/17/15 Time: 19:52
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLBO(-1)	-0.445848	0.146236	-3.048815	0.0045
C	4.177430	1.470141	2.841516	0.0076

R-squared	0.219771	Mean dependent var	-0.157143
Adjusted R-squared	0.196128	S.D. dependent var	2.469062
S.E. of regression	2.213734	Akaike info criterion	4.482684
Sum squared resid	161.7205	Schwarz criterion	4.571561
Log likelihood	-76.44697	Hannan-Quinn criter.	4.513364
F-statistic	9.295274	Durbin-Watson stat	2.124163
Prob(F-statistic)	0.004503		

Null Hypothesis: INFLBO has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.075522	0.2497
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLBO)
Method: Least Squares
Date: 05/17/15 Time: 19:53
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLBO(-1)	-0.044000	0.040910	-1.075522	0.2897

R-squared	0.028870	Mean dependent var	-0.157143
Adjusted R-squared	0.028870	S.D. dependent var	2.469062
S.E. of regression	2.433160	Akaike info criterion	4.644414
Sum squared resid	201.2891	Schwarz criterion	4.688853
Log likelihood	-80.27725	Hannan-Quinn criter.	4.659754
Durbin-Watson stat	2.654184		

FIRST

Null Hypothesis: D(INFLBO) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.985036	0.0000
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLBO,2)
Method: Least Squares
Date: 05/17/15 Time: 19:53
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLBO(-1))	-1.393496	0.155091	-8.985036	0.0000
C	-0.703775	0.817467	-0.860922	0.3959
@TREND("1980")	0.019379	0.039031	0.496509	0.6230

R-squared	0.723382	Mean dependent var	-0.130088
Adjusted R-squared	0.705536	S.D. dependent var	4.114459
S.E. of regression	2.232693	Akaike info criterion	4.528391
Sum squared resid	154.5324	Schwarz criterion	4.663070
Log likelihood	-73.98265	Hannan-Quinn criter.	4.574320
F-statistic	40.53397	Durbin-Watson stat	1.986459
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLBO) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.097821	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLBO,2)
Method: Least Squares
Date: 05/17/15 Time: 19:54
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLBO(-1))	-1.394216	0.153247	-9.097821	0.0000
C	-0.345372	0.379108	-0.911011	0.3691

R-squared	0.721182	Mean dependent var	-0.130088
Adjusted R-squared	0.712469	S.D. dependent var	4.114459
S.E. of regression	2.206250	Akaike info criterion	4.477488

Sum squared resid	155.7613	Schwarz criterion	4.567274
Log likelihood	-74.11730	Hannan-Quinn criter.	4.508108
F-statistic	82.77035	Durbin-Watson stat	1.970538
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLBO) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.082053	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLBO,2)
Method: Least Squares
Date: 05/17/15 Time: 19:54
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLBO(-1))	-1.385502	0.152554	-9.082053	0.0000

R-squared	0.713951	Mean dependent var	-0.130088
Adjusted R-squared	0.713951	S.D. dependent var	4.114459
S.E. of regression	2.200558	Akaike info criterion	4.444270
Sum squared resid	159.8011	Schwarz criterion	4.489163
Log likelihood	-74.55259	Hannan-Quinn criter.	4.459580
Durbin-Watson stat	1.931971		

LEVEL

Null Hypothesis: INFLSW has a unit root

Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.965836	0.0016
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSW)
Method: Least Squares
Date: 05/17/15 Time: 19:55
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLSW(-1)	-0.859302	0.173043	-4.965836	0.0000
C	12.75684	2.965281	4.302070	0.0001
@TREND("1980")	-0.253216	0.079931	-3.167919	0.0034

R-squared	0.436139	Mean dependent var	-0.377171
Adjusted R-squared	0.400898	S.D. dependent var	4.509184
S.E. of regression	3.490185	Akaike info criterion	5.419603
Sum squared resid	389.8044	Schwarz criterion	5.552918
Log likelihood	-91.84305	Hannan-Quinn criter.	5.465623
F-statistic	12.37579	Durbin-Watson stat	1.980648
Prob(F-statistic)	0.000104		

Null Hypothesis: INFLSW has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.398919	0.0178
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSW)
Method: Least Squares
Date: 05/17/15 Time: 19:55
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLSW(-1)	-0.485114	0.142726	-3.398919	0.0018
C	4.464437	1.572390	2.839269	0.0077

R-squared	0.259303	Mean dependent var	-0.377171
Adjusted R-squared	0.236858	S.D. dependent var	4.509184
S.E. of regression	3.939133	Akaike info criterion	5.635243
Sum squared resid	512.0533	Schwarz criterion	5.724121
Log likelihood	-96.61676	Hannan-Quinn criter.	5.665924
F-statistic	11.55265	Durbin-Watson stat	2.213511
Prob(F-statistic)	0.001783		

Null Hypothesis: INFLSW has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.776657	0.0720
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSW)
Method: Least Squares
Date: 05/17/15 Time: 19:55

Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLSW(-1)	-0.118002	0.066418	-1.776657	0.0846

R-squared	0.078361	Mean dependent var	-0.377171
Adjusted R-squared	0.078361	S.D. dependent var	4.509184
S.E. of regression	4.328907	Akaike info criterion	5.796663
Sum squared resid	637.1409	Schwarz criterion	5.841101
Log likelihood	-100.4416	Hannan-Quinn criter.	5.812003
Durbin-Watson stat	2.625213		

FIRST

Null Hypothesis: D(INFLSW) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.276357	0.0000
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSW,2)
Method: Least Squares
Date: 05/17/15 Time: 19:56
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLSW(-1))	-1.372490	0.165833	-8.276357	0.0000
C	-1.314088	1.598713	-0.821966	0.4174
@TREND("1980")	0.039932	0.076190	0.524111	0.6039

R-squared	0.688471	Mean dependent var	-0.087147

Adjusted R-squared	0.668373	S.D. dependent var	7.558814
S.E. of regression	4.352902	Akaike info criterion	5.863660
Sum squared resid	587.3805	Schwarz criterion	5.998339
Log likelihood	-96.68222	Hannan-Quinn criter.	5.909589
F-statistic	34.25463	Durbin-Watson stat	2.042376
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLSW) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.355658	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSW,2)
Method: Least Squares
Date: 05/17/15 Time: 19:56
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLSW(-1))	-1.368094	0.163733	-8.355658	0.0000
C	-0.573786	0.740302	-0.775070	0.4440

R-squared	0.685711	Mean dependent var	-0.087147
Adjusted R-squared	0.675889	S.D. dependent var	7.558814
S.E. of regression	4.303288	Akaike info criterion	5.813658
Sum squared resid	592.5853	Schwarz criterion	5.903444
Log likelihood	-96.83219	Hannan-Quinn criter.	5.844278
F-statistic	69.81703	Durbin-Watson stat	2.031302
Prob(F-statistic)	0.000000		

Null Hypothesis: D(INFLSW) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.371267	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSW,2)
Method: Least Squares
Date: 05/17/15 Time: 19:56
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLSW(-1))	-1.358111	0.162235	-8.371267	0.0000

R-squared	0.679811	Mean dependent var	-0.087147
Adjusted R-squared	0.679811	S.D. dependent var	7.558814
S.E. of regression	4.277176	Akaike info criterion	5.773434
Sum squared resid	603.7098	Schwarz criterion	5.818327
Log likelihood	-97.14837	Hannan-Quinn criter.	5.788744
Durbin-Watson stat	2.007809		

Null Hypothesis: D(INFLSW) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.371267	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLSW,2)
Method: Least Squares
Date: 05/17/15 Time: 20:19
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLSW(-1))	-1.358111	0.162235	-8.371267	0.0000

R-squared	0.679811	Mean dependent var	-0.087147
Adjusted R-squared	0.679811	S.D. dependent var	7.558814
S.E. of regression	4.277176	Akaike info criterion	5.773434
Sum squared resid	603.7098	Schwarz criterion	5.818327
Log likelihood	-97.14837	Hannan-Quinn criter.	5.788744
Durbin-Watson stat	2.007809		

Null Hypothesis: XRATESA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.482713	0.3341
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESA)
Method: Least Squares
Date: 05/17/15 Time: 20:01
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATESA(-1)	-0.309780	0.124775	-2.482713	0.0185
C	41.06063	18.23951	2.251192	0.0314
@TREND("1980")	-0.540851	0.295247	-1.831857	0.0763

R-squared	0.164406	Mean dependent var	-2.290670
Adjusted R-squared	0.112182	S.D. dependent var	10.67840
S.E. of regression	10.06163	Akaike info criterion	7.537151
Sum squared resid	3239.562	Schwarz criterion	7.670466
Log likelihood	-128.9001	Hannan-Quinn criter.	7.583171
F-statistic	3.148066	Durbin-Watson stat	1.508520
Prob(F-statistic)	0.056483		

Null Hypothesis: XRATESA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.656657	0.4438
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESA)
Method: Least Squares
Date: 05/17/15 Time: 20:02
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATESA(-1)	-0.122034	0.073663	-1.656657	0.1071
C	10.95193	8.185109	1.338031	0.1900

R-squared	0.076781	Mean dependent var	-2.290670
Adjusted R-squared	0.048805	S.D. dependent var	10.67840
S.E. of regression	10.41456	Akaike info criterion	7.579732
Sum squared resid	3579.280	Schwarz criterion	7.668609

Log likelihood	-130.6453	Hannan-Quinn criter.	7.610412
F-statistic	2.744514	Durbin-Watson stat	1.629422
Prob(F-statistic)	0.107068		

Null Hypothesis: XRATESA has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.608496	0.1005
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESA)
Method: Least Squares
Date: 05/17/15 Time: 20:02
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATESA(-1)	-0.025777	0.016026	-1.608496	0.1170

R-squared	0.026695	Mean dependent var	-2.290670
Adjusted R-squared	0.026695	S.D. dependent var	10.67840
S.E. of regression	10.53491	Akaike info criterion	7.575421
Sum squared resid	3773.465	Schwarz criterion	7.619859
Log likelihood	-131.5699	Hannan-Quinn criter.	7.590761
Durbin-Watson stat	1.699402		

FIRST

Null Hypothesis: D(XRATESA) has a unit root
Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.973955	0.0016
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESA,2)
Method: Least Squares
Date: 05/17/15 Time: 20:03
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATESA(-1))	-0.869774	0.174866	-4.973955	0.0000
C	-4.373022	4.025036	-1.086455	0.2857
@TREND("1980")	0.111937	0.190250	0.588369	0.5605

R-squared	0.444421	Mean dependent var	-0.355821
Adjusted R-squared	0.408577	S.D. dependent var	14.11693
S.E. of regression	10.85649	Akaike info criterion	7.691501
Sum squared resid	3653.767	Schwarz criterion	7.826180
Log likelihood	-127.7555	Hannan-Quinn criter.	7.737430
F-statistic	12.39881	Durbin-Watson stat	1.874221
Prob(F-statistic)	0.000111		

Null Hypothesis: D(XRATESA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.996143	0.0003
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	

	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESA,2)
Method: Least Squares
Date: 05/17/15 Time: 20:04
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATESA(-1))	-0.862547	0.172643	-4.996143	0.0000
C	-2.286012	1.882817	-1.214145	0.2336

R-squared	0.438216	Mean dependent var	-0.355821
Adjusted R-squared	0.420661	S.D. dependent var	14.11693
S.E. of regression	10.74501	Akaike info criterion	7.643783
Sum squared resid	3694.569	Schwarz criterion	7.733569
Log likelihood	-127.9443	Hannan-Quinn criter.	7.674402
F-statistic	24.96144	Durbin-Watson stat	1.863674
Prob(F-statistic)	0.000020		

Null Hypothesis: D(XRATESA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.815741	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESA,2)
Method: Least Squares
Date: 05/17/15 Time: 20:04
Sample (adjusted): 1982 2015

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATESA(-1))	-0.819536	0.170179	-4.815741	0.0000

R-squared	0.412337	Mean dependent var	-0.355821
Adjusted R-squared	0.412337	S.D. dependent var	14.11693
S.E. of regression	10.82193	Akaike info criterion	7.629997
Sum squared resid	3864.767	Schwarz criterion	7.674890
Log likelihood	-128.7099	Hannan-Quinn criter.	7.645307
Durbin-Watson stat	1.841553		

LEVEL

Null Hypothesis: XTRATENA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.550218	0.0494
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XTRATENA)
Method: Least Squares
Date: 05/17/15 Time: 20:05
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XTRATENA(-1)	-0.559044	0.157468	-3.550218	0.0012
C	0.082291	0.498979	0.164918	0.8700
@TREND("1980")	0.247542	0.072459	3.416323	0.0017

R-squared	0.283211	Mean dependent var	0.407295
Adjusted R-squared	0.238412	S.D. dependent var	1.640035

S.E. of regression	1.431243	Akaike info criterion	3.636779
Sum squared resid	65.55057	Schwarz criterion	3.770095
Log likelihood	-60.64364	Hannan-Quinn criter.	3.682800
F-statistic	6.321782	Durbin-Watson stat	1.803273
Prob(F-statistic)	0.004856		

Null Hypothesis: XTRATENA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.857154	0.7898
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XTRATENA)
Method: Least Squares
Date: 05/17/15 Time: 20:05
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XTRATENA(-1)	-0.051331	0.059885	-0.857154	0.3975
C	0.786577	0.522735	1.504735	0.1419

R-squared	0.021779	Mean dependent var	0.407295
Adjusted R-squared	-0.007864	S.D. dependent var	1.640035
S.E. of regression	1.646471	Akaike info criterion	3.890591
Sum squared resid	89.45863	Schwarz criterion	3.979468
Log likelihood	-66.08534	Hannan-Quinn criter.	3.921271
F-statistic	0.734713	Durbin-Watson stat	2.136220
Prob(F-statistic)	0.397542		

Null Hypothesis: XTRATENA has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.768326	0.8751
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XTRATENA)
Method: Least Squares
Date: 05/17/15 Time: 20:05
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XTRATENA(-1)	0.024948	0.032470	0.768326	0.4476

R-squared	-0.045340	Mean dependent var	0.407295
Adjusted R-squared	-0.045340	S.D. dependent var	1.640035
S.E. of regression	1.676802	Akaike info criterion	3.899810
Sum squared resid	95.59665	Schwarz criterion	3.944248
Log likelihood	-67.24667	Hannan-Quinn criter.	3.915150
Durbin-Watson stat	2.155532		

FIRST DIFFERENCE

Null Hypothesis: D(XTRATENA) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.177329	0.0001
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XTRATENA,2)
Method: Least Squares
Date: 05/17/15 Time: 20:06
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XTRATENA(-1))	-1.130238	0.182965	-6.177329	0.0000
C	0.365182	0.624073	0.585158	0.5627
@TREND("1980")	0.005942	0.029904	0.198720	0.8438

R-squared	0.552793	Mean dependent var	-0.051040
Adjusted R-squared	0.523941	S.D. dependent var	2.467727
S.E. of regression	1.702659	Akaike info criterion	3.986356
Sum squared resid	89.87044	Schwarz criterion	4.121035
Log likelihood	-64.76805	Hannan-Quinn criter.	4.032286
F-statistic	19.15957	Durbin-Watson stat	2.008855
Prob(F-statistic)	0.000004		

Null Hypothesis: D(XTRATENA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.282054	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XTRATENA,2)
Method: Least Squares
Date: 05/17/15 Time: 20:06

Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XTRATENA(-1))	-1.126727	0.179356	-6.282054	0.0000
C	0.473482	0.299463	1.581102	0.1237

R-squared	0.552223	Mean dependent var	-0.051040
Adjusted R-squared	0.538230	S.D. dependent var	2.467727
S.E. of regression	1.676910	Akaike info criterion	3.928806
Sum squared resid	89.98492	Schwarz criterion	4.018592
Log likelihood	-64.78970	Hannan-Quinn criter.	3.959425
F-statistic	39.46420	Durbin-Watson stat	2.011255
Prob(F-statistic)	0.000000		

Null Hypothesis: D(XTRATENA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.948732	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XTRATENA,2)
Method: Least Squares
Date: 05/17/15 Time: 20:07
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XTRATENA(-1))	-1.047660	0.176115	-5.948732	0.0000

R-squared	0.517242	Mean dependent var	-0.051040
Adjusted R-squared	0.517242	S.D. dependent var	2.467727
S.E. of regression	1.714596	Akaike info criterion	3.945202
Sum squared resid	97.01467	Schwarz criterion	3.990095
Log likelihood	-66.06844	Hannan-Quinn criter.	3.960512
Durbin-Watson stat	1.986889		

LEVEL

Null Hypothesis: XRATELE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.007602	0.5770
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATELE)
Method: Least Squares
Date: 05/17/15 Time: 20:10
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATELE(-1)	-0.210967	0.105084	-2.007602	0.0532
C	44.20946	23.43684	1.886323	0.0684
@TREND("1980")	-0.971776	0.492280	-1.974031	0.0571

R-squared	0.116196	Mean dependent var	-3.609195
Adjusted R-squared	0.060959	S.D. dependent var	14.05506
S.E. of regression	13.61993	Akaike info criterion	8.142762
Sum squared resid	5936.083	Schwarz criterion	8.276078
Log likelihood	-139.4983	Hannan-Quinn criter.	8.188783
F-statistic	2.103567	Durbin-Watson stat	1.748870
Prob(F-statistic)	0.138578		

Null Hypothesis: XRATELE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.534128	0.8724
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATELE)
Method: Least Squares
Date: 05/17/15 Time: 20:11
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATELE(-1)	-0.027107	0.050750	-0.534128	0.5968
C	0.287461	7.680341	0.037428	0.9704

R-squared	0.008571	Mean dependent var	-3.609195
Adjusted R-squared	-0.021472	S.D. dependent var	14.05506
S.E. of regression	14.20515	Akaike info criterion	8.200532
Sum squared resid	6658.949	Schwarz criterion	8.289409
Log likelihood	-141.5093	Hannan-Quinn criter.	8.231212
F-statistic	0.285292	Durbin-Watson stat	1.866857
Prob(F-statistic)	0.596833		

Null Hypothesis: XRATELE has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-1.618725	0.0985
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATELE)
Method: Least Squares
Date: 05/17/15 Time: 20:11
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATELE(-1)	-0.025303	0.015631	-1.618725	0.1147

R-squared	0.008529	Mean dependent var	-3.609195
Adjusted R-squared	0.008529	S.D. dependent var	14.05506
S.E. of regression	13.99499	Akaike info criterion	8.143431
Sum squared resid	6659.231	Schwarz criterion	8.187870
Log likelihood	-141.5100	Hannan-Quinn criter.	8.158771
Durbin-Watson stat	1.870115		

FIRST DIFFRENCE

Null Hypothesis: D(XRATELE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.325390	0.0006
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(XRATELE,2)
Method: Least Squares
Date: 05/17/15 Time: 20:11
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATELE(-1))	-0.957116	0.179727	-5.325390	0.0000
C	-1.508535	5.381406	-0.280324	0.7811
@TREND("1980")	-0.104689	0.256643	-0.407916	0.6861

R-squared	0.477954	Mean dependent var	-0.174191
Adjusted R-squared	0.444274	S.D. dependent var	19.67073
S.E. of regression	14.66395	Akaike info criterion	8.292758
Sum squared resid	6665.973	Schwarz criterion	8.427437
Log likelihood	-137.9769	Hannan-Quinn criter.	8.338688
F-statistic	14.19087	Durbin-Watson stat	1.986550
Prob(F-statistic)	0.000042		

Null Hypothesis: D(XRATELE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.382380	0.0001
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATELE,2)
Method: Least Squares
Date: 05/17/15 Time: 20:12
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATELE(-1))	-0.953537	0.177159	-5.382380	0.0000

C	-3.433048	2.554661	-1.343837	0.1885

R-squared	0.475152	Mean dependent var	-0.174191
Adjusted R-squared	0.458750	S.D. dependent var	19.67073
S.E. of regression	14.47169	Akaike info criterion	8.239288
Sum squared resid	6701.753	Schwarz criterion	8.329074
Log likelihood	-138.0679	Hannan-Quinn criter.	8.269908
F-statistic	28.97001	Durbin-Watson stat	1.982282
Prob(F-statistic)	0.000007		

Null Hypothesis: D(XRATELE) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.149889	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATELE,2)
Method: Least Squares
Date: 05/17/15 Time: 20:12
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATELE(-1))	-0.897113	0.174200	-5.149889	0.0000

R-squared	0.445532	Mean dependent var	-0.174191
Adjusted R-squared	0.445532	S.D. dependent var	19.67073
S.E. of regression	14.64733	Akaike info criterion	8.235364
Sum squared resid	7079.962	Schwarz criterion	8.280257
Log likelihood	-139.0012	Hannan-Quinn criter.	8.250674
Durbin-Watson stat	1.975144		

LEVEL

Null Hypothesis: XRATEBO has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.488868	0.3313
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATEBO)
Method: Least Squares
Date: 05/17/15 Time: 20:14
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATEBO(-1)	-0.305540	0.122763	-2.488868	0.0182
C	0.166027	0.124647	1.331976	0.1923
@TREND("1980")	0.068935	0.027313	2.523867	0.0168

R-squared	0.166347	Mean dependent var	0.202049
Adjusted R-squared	0.114243	S.D. dependent var	0.383142
S.E. of regression	0.360593	Akaike info criterion	0.879682
Sum squared resid	4.160871	Schwarz criterion	1.012998
Log likelihood	-12.39444	Hannan-Quinn criter.	0.925703
F-statistic	3.192631	Durbin-Watson stat	1.477959
Prob(F-statistic)	0.054421		

Null Hypothesis: XRATEBO has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-0.114934	0.9400
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATEBO)
Method: Least Squares
Date: 05/17/15 Time: 20:14
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATEBO(-1)	-0.003362	0.029249	-0.114934	0.9092
C	0.215305	0.132748	1.621915	0.1143

R-squared	0.000400	Mean dependent var	0.202049
Adjusted R-squared	-0.029891	S.D. dependent var	0.383142
S.E. of regression	0.388826	Akaike info criterion	1.004077
Sum squared resid	4.989132	Schwarz criterion	1.092954
Log likelihood	-15.57134	Hannan-Quinn criter.	1.034757
F-statistic	0.013210	Durbin-Watson stat	1.636849
Prob(F-statistic)	0.909194		

Null Hypothesis: XRATEBO has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.553575	0.9966
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATEBO)

Method: Least Squares
Date: 05/17/15 Time: 20:14
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATEBO(-1)	0.037856	0.014825	2.553575	0.0153

R-squared	-0.079283	Mean dependent var	0.202049
Adjusted R-squared	-0.079283	S.D. dependent var	0.383142
S.E. of regression	0.398041	Akaike info criterion	1.023631
Sum squared resid	5.386843	Schwarz criterion	1.068070
Log likelihood	-16.91355	Hannan-Quinn criter.	1.038972
Durbin-Watson stat	1.580044		

Null Hypothesis: D(XRATEBO) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.674230	0.0035
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATEBO,2)
Method: Least Squares
Date: 05/17/15 Time: 20:15
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATEBO(-1))	-0.825853	0.176682	-4.674230	0.0001
C	0.141039	0.146529	0.962533	0.3432
@TREND("1980")	0.001627	0.006900	0.235752	0.8152

R-squared	0.413526	Mean dependent var	0.004632

Adjusted R-squared	0.375689	S.D. dependent var	0.498271
S.E. of regression	0.393701	Akaike info criterion	1.057647
Sum squared resid	4.805013	Schwarz criterion	1.192326
Log likelihood	-14.98000	Hannan-Quinn criter.	1.103576
F-statistic	10.92913	Durbin-Watson stat	1.894177
Prob(F-statistic)	0.000256		

Null Hypothesis: D(XRATEBO) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.739801	0.0005
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATEBO,2)
Method: Least Squares
Date: 05/17/15 Time: 20:15
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATEBO(-1))	-0.822871	0.173609	-4.739801	0.0000
C	0.170531	0.075162	2.268831	0.0302

R-squared	0.412474	Mean dependent var	0.004632
Adjusted R-squared	0.394114	S.D. dependent var	0.498271
S.E. of regression	0.387848	Akaike info criterion	1.000615
Sum squared resid	4.813628	Schwarz criterion	1.090401
Log likelihood	-15.01045	Hannan-Quinn criter.	1.031234
F-statistic	22.46571	Durbin-Watson stat	1.894958
Prob(F-statistic)	0.000042		

Null Hypothesis: D(XRATEBO) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.922859	0.0003
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATEBO,2)
Method: Least Squares
Date: 05/17/15 Time: 20:15
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATEBO(-1))	-0.639447	0.163005	-3.922859	0.0004

R-squared	0.317964	Mean dependent var	0.004632
Adjusted R-squared	0.317964	S.D. dependent var	0.498271
S.E. of regression	0.411500	Akaike info criterion	1.090954
Sum squared resid	5.587960	Schwarz criterion	1.135847
Log likelihood	-17.54622	Hannan-Quinn criter.	1.106264
Durbin-Watson stat	1.904588		

LEVEL

Null Hypothesis: XRATESW has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.550220	0.0494
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESW)
Method: Least Squares
Date: 05/17/15 Time: 20:16
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATESW(-1)	-0.559045	0.157468	-3.550220	0.0012
C	0.082292	0.498979	0.164921	0.8700
@TREND("1980")	0.247543	0.072459	3.416325	0.0017

R-squared	0.283212	Mean dependent var	0.407295
Adjusted R-squared	0.238412	S.D. dependent var	1.640035
S.E. of regression	1.431242	Akaike info criterion	3.636779
Sum squared resid	65.55054	Schwarz criterion	3.770095
Log likelihood	-60.64363	Hannan-Quinn criter.	3.682800
F-statistic	6.321789	Durbin-Watson stat	1.803273
Prob(F-statistic)	0.004856		

Null Hypothesis: XRATESW has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.857155	0.7898
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESW)
Method: Least Squares
Date: 05/17/15 Time: 20:16
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATESW(-1)	-0.051331	0.059885	-0.857155	0.3975
C	0.786578	0.522735	1.504736	0.1419

R-squared	0.021779	Mean dependent var	0.407295
Adjusted R-squared	-0.007864	S.D. dependent var	1.640035
S.E. of regression	1.646471	Akaike info criterion	3.890591
Sum squared resid	89.45863	Schwarz criterion	3.979468
Log likelihood	-66.08534	Hannan-Quinn criter.	3.921271
F-statistic	0.734714	Durbin-Watson stat	2.136220
Prob(F-statistic)	0.397542		

Null Hypothesis: XRATESW has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.768326	0.8751
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESW)
Method: Least Squares
Date: 05/17/15 Time: 20:16
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATESW(-1)	0.024948	0.032470	0.768326	0.4476

R-squared	-0.045340	Mean dependent var	0.407295
Adjusted R-squared	-0.045340	S.D. dependent var	1.640035
S.E. of regression	1.676802	Akaike info criterion	3.899810
Sum squared resid	95.59665	Schwarz criterion	3.944248
Log likelihood	-67.24667	Hannan-Quinn criter.	3.915150
Durbin-Watson stat	2.155532		

Null Hypothesis: D(XRATESW) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.177330	0.0001
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESW,2)
Method: Least Squares
Date: 05/17/15 Time: 20:17
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATESW(-1))	-1.130238	0.182965	-6.177330	0.0000
C	0.365182	0.624073	0.585159	0.5627
@TREND("1980")	0.005942	0.029904	0.198719	0.8438

R-squared	0.552793	Mean dependent var	-0.051040
Adjusted R-squared	0.523941	S.D. dependent var	2.467727
S.E. of regression	1.702659	Akaike info criterion	3.986356
Sum squared resid	89.87043	Schwarz criterion	4.121035
Log likelihood	-64.76805	Hannan-Quinn criter.	4.032285
F-statistic	19.15957	Durbin-Watson stat	2.008855
Prob(F-statistic)	0.000004		

Null Hypothesis: D(XRATESW) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-6.282054	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESW,2)
Method: Least Squares
Date: 05/17/15 Time: 20:17
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATESW(-1))	-1.126727	0.179356	-6.282054	0.0000
C	0.473482	0.299463	1.581103	0.1237

R-squared	0.552223	Mean dependent var	-0.051040
Adjusted R-squared	0.538230	S.D. dependent var	2.467727
S.E. of regression	1.676910	Akaike info criterion	3.928806
Sum squared resid	89.98492	Schwarz criterion	4.018592
Log likelihood	-64.78970	Hannan-Quinn criter.	3.959425
F-statistic	39.46420	Durbin-Watson stat	2.011255
Prob(F-statistic)	0.000000		

Null Hypothesis: D(XRATESW) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.948733	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(XRATESW,2)
Method: Least Squares
Date: 05/17/15 Time: 20:17
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(XRATESW(-1))	-1.047660	0.176115	-5.948733	0.0000

R-squared	0.517242	Mean dependent var	-0.051040
Adjusted R-squared	0.517242	S.D. dependent var	2.467727
S.E. of regression	1.714596	Akaike info criterion	3.945202
Sum squared resid	97.01466	Schwarz criterion	3.990095
Log likelihood	-66.06844	Hannan-Quinn criter.	3.960512
Durbin-Watson stat	1.986889		

Ramsey RESET Test
Equation: UNTITLED
Specification: GDPSA GDPNA GDPLE GDPBO GDPSW C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.006395	30	0.9949
F-statistic	4.09E-05	(1, 30)	0.9949
Likelihood ratio	4.91E-05	1	0.9944

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.102532	1	0.102532
Restricted SSR	75223.42	31	2426.562
Unrestricted SSR	75223.32	30	2507.444
Unrestricted SSR	75223.32	30	2507.444

LR test summary:

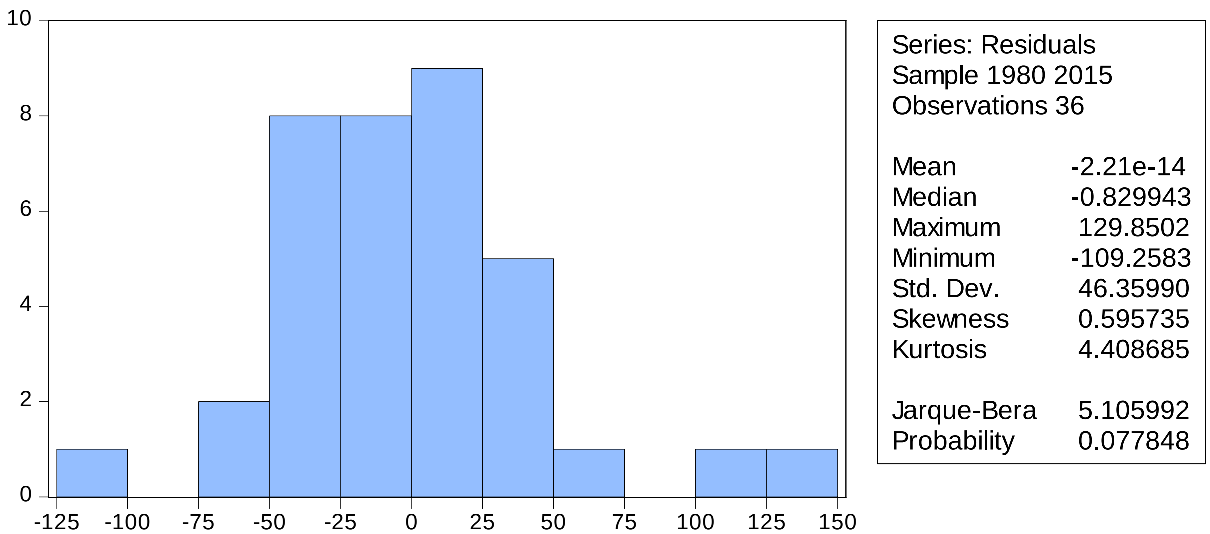
	Value	df
Restricted LogL	-188.6864	31
Unrestricted LogL	-188.6863	30

Unrestricted Test Equation:
Dependent Variable: GDPSA

Method: Least Squares
Date: 05/17/15 Time: 18:42
Sample: 1980 2015
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPNA	1.74E-07	6.64E-08	2.620189	0.0137
GDPLE	-3.56E-08	1.44E-07	-0.248156	0.8057
GDPBO	1.645703	2.118528	0.776815	0.4434
GDPSW	3.776193	2.496291	1.512721	0.1408
C	339.6393	108.3292	3.135251	0.0038
FITTED^2	-6.23E-07	9.75E-05	-0.006395	0.9949

R-squared	0.984139	Mean dependent var	1354.554
Adjusted R-squared	0.981495	S.D. dependent var	368.1056
S.E. of regression	50.07438	Akaike info criterion	10.81591
Sum squared resid	75223.32	Schwarz criterion	11.07983
Log likelihood	-188.6863	Hannan-Quinn criter.	10.90802
F-statistic	372.2784	Durbin-Watson stat	1.184679
Prob(F-statistic)	0.000000		



Heteroskedasticity Test: ARCH

F-statistic	78.99190	Prob. F(1,33)	0.0000
Obs*R-squared	24.68675	Prob. Chi-Square(1)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/17/15 Time: 18:45
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	318.9098	421.8396	0.755998	0.4550
RESID^2(-1)	1.097199	0.123451	8.887739	0.0000

R-squared	0.705336	Mean dependent var	2148.485
Adjusted R-squared	0.696407	S.D. dependent var	3953.431
S.E. of regression	2178.313	Akaike info criterion	18.26593
Sum squared resid	1.57E+08	Schwarz criterion	18.35481
Log likelihood	-317.6539	Hannan-Quinn criter.	18.29661
F-statistic	78.99190	Durbin-Watson stat	2.075836
Prob(F-statistic)	0.000000		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

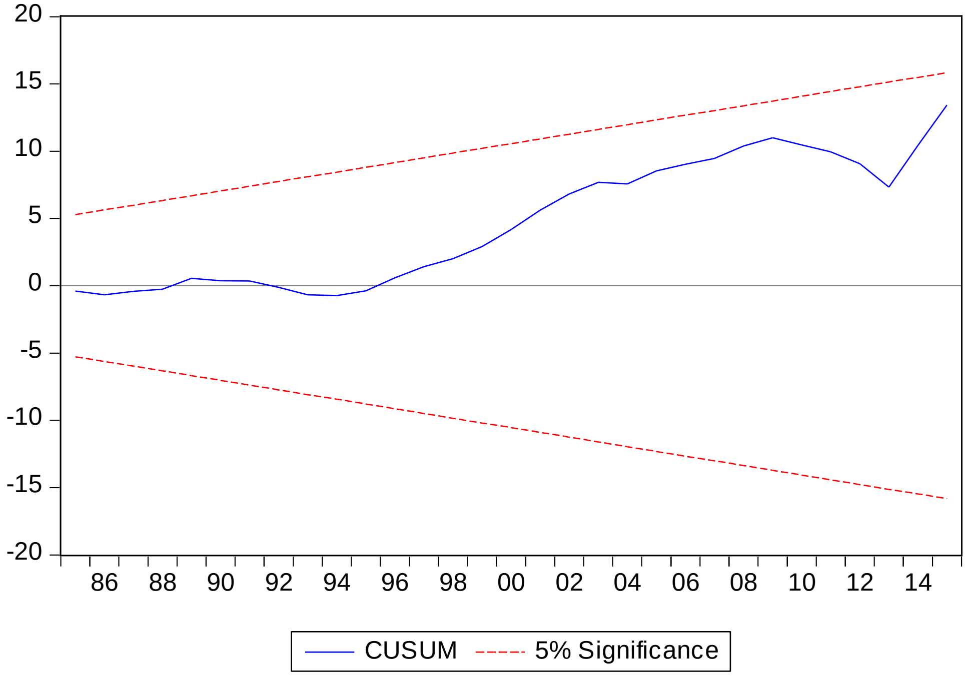
F-statistic	2.510135	Prob. F(4,31)	0.0619
Obs*R-squared	8.807375	Prob. Chi-Square(4)	0.0661
Scaled explained SS	11.13068	Prob. Chi-Square(4)	0.0251

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/17/15 Time: 18:45
Sample: 1980 2015
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3838.821	2967.912	-1.293441	0.2054
GDPNA	4.81E-08	1.70E-06	0.028311	0.9776
GDPLE	4.54E-06	8.88E-06	0.511457	0.6127

GDPBO	38.93032	143.5702	0.271159	0.7881
GDPSW	44.73151	167.6943	0.266744	0.7914

R-squared	0.244649	Mean dependent var	2089.540
Adjusted R-squared	0.147185	S.D. dependent var	3912.562
S.E. of regression	3613.173	Akaike info criterion	19.35081
Sum squared resid	4.05E+08	Schwarz criterion	19.57074
Log likelihood	-343.3145	Hannan-Quinn criter.	19.42757
F-statistic	2.510135	Durbin-Watson stat	0.398473
Prob(F-statistic)	0.061919		



Date: 05/17/15 Time: 18:53
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments
Trend assumption: Linear deterministic trend
Series: GDPSA GDPNA GDPLE GDPBO GDPSW
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.537318	59.34772	69.81889	0.2559
At most 1	0.413362	33.14338	47.85613	0.5489
At most 2	0.242371	15.00958	29.79707	0.7795
At most 3	0.135587	5.572476	15.49471	0.7454
At most 4	0.018027	0.618505	3.841466	0.4316

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.537318	26.20434	33.87687	0.3084
At most 1	0.413362	18.13380	27.58434	0.4840
At most 2	0.242371	9.437104	21.13162	0.7957
At most 3	0.135587	4.953971	14.26460	0.7476
At most 4	0.018027	0.618505	3.841466	0.4316

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDPSA	GDPNA	GDPLE	GDPBO	GDPSW
-0.034798	7.21E-09	-6.46E-09	-0.006566	0.316032
-0.006874	1.39E-09	-1.19E-09	0.305013	-0.277358
0.000669	6.61E-10	-4.30E-09	0.072411	0.188956
0.000868	2.19E-09	-1.44E-08	-0.130394	-0.216713
0.016724	-1.67E-09	-2.63E-09	0.067959	0.004606

Unrestricted Adjustment Coefficients (alpha):

D(GDPSA)	2.839792	0.164768	-11.14163	-1.385739	1.746971
D(GDPNA)	-1.29E+08	-1.03E+08	-21558706	-12968433	23093128
D(GDPLE)	-9445205.	-14229924	3161148.	5254715.	4808717.
D(GDPBO)	0.764940	-2.246456	-1.110379	0.140686	-0.143045
D(GDPSW)	-0.982290	1.015585	-0.899153	0.577564	-0.028435

1 Cointegrating Equation(s):		Log likelihood	-1667.729	

Normalized cointegrating coefficients (standard error in parentheses)

GDPSA	GDPNA	GDPLE	GDPBO	GDPSW
1.000000	-2.07E-07	1.86E-07	0.188705	-9.082023
	(1.5E-08)	(8.2E-08)	(1.77431)	(2.32919)

Adjustment coefficients (standard error in parentheses)

D(GDPSA)	-0.098818
	(0.17751)
D(GDPNA)	4502992.
	(1804311)
D(GDPLE)	328670.3
	(306469.)
D(GDPBO)	-0.026618
	(0.02925)
D(GDPSW)	0.034181
	(0.02028)

2 Cointegrating Equation(s):		Log likelihood	-1658.662	

Normalized cointegrating coefficients (standard error in parentheses)

GDPSA	GDPNA	GDPLE	GDPBO	GDPSW
1.000000	0.000000	-4.28E-07	-2075.137	2293.087
		(6.3E-06)	(539.280)	(708.375)
0.000000	1.000000	-2.958716	-1.00E+10	1.11E+10
		(30.4203)	(2.6E+09)	(3.4E+09)

Adjustment coefficients (standard error in parentheses)

D(GDPSA)	-0.099951	2.07E-08
	(0.18094)	(3.7E-08)
D(GDPNA)	5207825.	-1.076224
	(1700809)	(0.35222)
D(GDPLE)	426493.4	-0.087959
	(296906.)	(0.06149)
D(GDPBO)	-0.011175	2.38E-09
	(0.02557)	(5.3E-09)
D(GDPSW)	0.027200	-5.67E-09
	(0.01947)	(4.0E-09)

3 Cointegrating		Log	-1653.943

Equation(s):		likelihood		

Normalized cointegrating coefficients (standard error in parentheses)

GDPSA	GDPNA	GDPLE	GDPBO	GDPSW
1.000000	0.000000	0.000000	-3754.365	4098.639
			(897.917)	(1138.72)
0.000000	1.000000	0.000000	-2.16E+10	2.36E+10
			(5.2E+09)	(6.6E+09)
0.000000	0.000000	1.000000	-3.93E+09	4.22E+09
			(9.4E+08)	(1.2E+09)

Adjustment coefficients (standard error in parentheses)

D(GDPSA)	-0.107401	1.33E-08	2.93E-08
	(0.16421)	(3.4E-08)	(3.6E-08)
D(GDPNA)	5193408.	-1.090469	1.050442
	(1694732)	(0.35232)	(0.37501)
D(GDPLE)	428607.3	-0.085870	0.064328
	(296174.)	(0.06157)	(0.06554)
D(GDPBO)	-0.011917	1.65E-09	2.49E-09
	(0.02443)	(5.1E-09)	(5.4E-09)
D(GDPSW)	0.026598	-6.26E-09	9.01E-09
	(0.01848)	(3.8E-09)	(4.1E-09)

4 Cointegrating Equation(s):		Log likelihood	-1651.466	

Normalized cointegrating coefficients (standard error in parentheses)

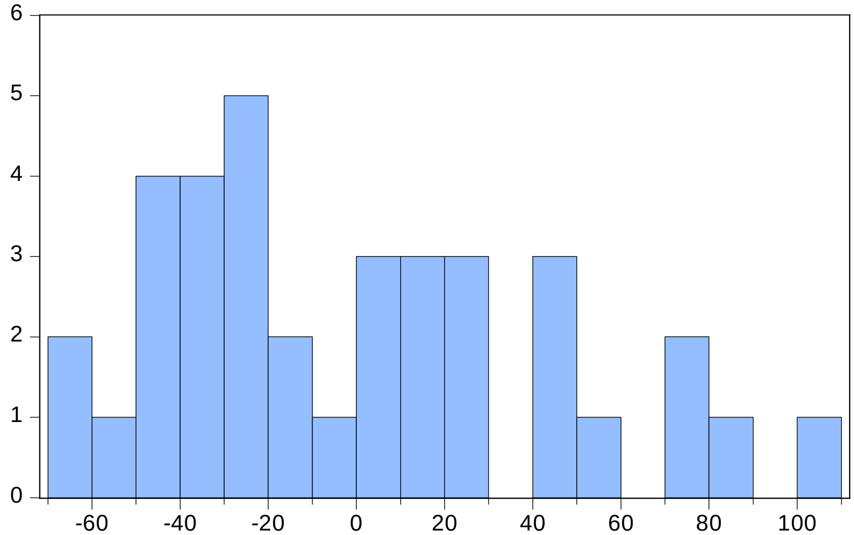
GDPSA	GDPNA	GDPLE	GDPBO	GDPSW
1.000000	0.000000	0.000000	0.000000	769.1842
				(246.361)
0.000000	1.000000	0.000000	0.000000	4.42E+09
				(1.4E+09)
0.000000	0.000000	1.000000	0.000000	7.40E+08
				(2.3E+08)
0.000000	0.000000	0.000000	1.000000	-0.886822
				(0.23562)

Adjustment coefficients (standard error in parentheses)

D(GDPSA)	-0.108604	1.03E-08	4.93E-08	-0.594476
	(0.16399)	(3.6E-08)	(7.6E-08)	(1.56927)
D(GDPNA)	5182149.	-1.118875	1.237531	-30293085
	(1692924)	(0.36703)	(0.78352)	(1.6E+07)
D(GDPLE)	433169.2	-0.074360	-0.011479	-4734574.
	(294081.)	(0.06376)	(0.13611)	(2814188)
D(GDPBO)	-0.011795	1.96E-09	4.63E-10	-0.788970
	(0.02442)	(5.3E-09)	(1.1E-08)	(0.23365)

D(GDPSW)	0.027100	-5.00E-09	6.74E-10	0.175798
	(0.01806)	(3.9E-09)	(8.4E-09)	(0.17283)

INFLATION RATE



Series: Residuals
Sample 1980 2015
Observations 36

Mean	-3.65e-14
Median	-7.668564
Maximum	104.7203
Minimum	-66.43416
Std. Dev.	43.80015
Skewness	0.585131
Kurtosis	2.527107
Jarque-Bera	2.389713
Probability	0.302747

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.696895	Prob. F(4,31)	0.5999
Obs*R-squared	2.970113	Prob. Chi-Square(4)	0.5628
Scaled explained SS	1.681632	Prob. Chi-Square(4)	0.7941

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/17/15 Time: 19:38
Sample: 1980 2015
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2820.373	1702.907	1.656211	0.1078
INFLNA	63.09588	81.34746	0.775634	0.4438
INFLLE	-73.43116	63.59779	-1.154618	0.2571

INFLBO	-67.31319	177.5230	-0.379180	0.7071
INFLSW	-6.445311	105.2749	-0.061224	0.9516

R-squared	0.082503	Mean dependent var	1865.162
Adjusted R-squared	-0.035884	S.D. dependent var	2337.592
S.E. of regression	2379.163	Akaike info criterion	18.51513
Sum squared resid	1.75E+08	Schwarz criterion	18.73506
Log likelihood	-328.2724	Hannan-Quinn criter.	18.59189
F-statistic	0.696895	Durbin-Watson stat	1.940861
Prob(F-statistic)	0.599898		

Heteroskedasticity Test: ARCH

F-statistic	1.078287	Prob. F(1,33)	0.3066
Obs*R-squared	1.107451	Prob. Chi-Square(1)	0.2926

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/17/15 Time: 19:38
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1566.645	510.7420	3.067390	0.0043
RESID^2(-1)	0.177263	0.170707	1.038406	0.3066

R-squared	0.031641	Mean dependent var	1897.679
Adjusted R-squared	0.002297	S.D. dependent var	2363.444
S.E. of regression	2360.728	Akaike info criterion	18.42677
Sum squared resid	1.84E+08	Schwarz criterion	18.51565
Log likelihood	-320.4685	Hannan-Quinn criter.	18.45745
F-statistic	1.078287	Durbin-Watson stat	1.969983
Prob(F-statistic)	0.306630		

Ramsey RESET Test
Equation: UNTITLED
Specification: INFLSA INFLNA INFLLE INFLBO INFLSW C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.227316	30	0.8217
F-statistic	0.051673	(1, 30)	0.8217
Likelihood ratio	0.061954	1	0.8034

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	115.4547	1	115.4547
Restricted SSR	67145.85	31	2165.995
Unrestricted SSR	67030.39	30	2234.346
Unrestricted SSR	67030.39	30	2234.346

LR test summary:

	Value	df
Restricted LogL	-186.6416	31
Unrestricted LogL	-186.6107	30

Unrestricted Test Equation:
Dependent Variable: INFLSA
Method: Least Squares
Date: 05/17/15 Time: 19:39
Sample: 1980 2015
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLNA	-1.183064	2.364837	-0.500273	0.6205
INFLLE	-1.193643	2.409402	-0.495411	0.6239
INFLBO	-6.508992	7.103020	-0.916370	0.3668
INFLSW	-4.519450	4.071278	-1.110081	0.2758
C	215.8995	185.7432	1.162355	0.2543
FITTED^2	0.000987	0.004342	0.227316	0.8217

R-squared	0.548038	Mean dependent var	94.79640
Adjusted R-squared	0.472711	S.D. dependent var	65.09547
S.E. of regression	47.26887	Akaike info criterion	10.70059
Sum squared resid	67030.39	Schwarz criterion	10.96451
Log likelihood	-186.6107	Hannan-Quinn criter.	10.79271
F-statistic	7.275446	Durbin-Watson stat	0.916235
Prob(F-statistic)	0.000145		

Date: 05/17/15 Time: 19:39
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments
Trend assumption: Linear deterministic trend
Series: INFLSA INFLNA INFLLE INFLBO INFLSW
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.729768	99.74758	69.81889	0.0000
At most 1 *	0.571178	55.25940	47.85613	0.0086
At most 2	0.351242	26.47118	29.79707	0.1152
At most 3	0.292244	11.75953	15.49471	0.1688
At most 4	0.000212	0.007217	3.841466	0.9319

Trace test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.729768	44.48817	33.87687	0.0019
At most 1 *	0.571178	28.78822	27.58434	0.0349
At most 2	0.351242	14.71166	21.13162	0.3096
At most 3	0.292244	11.75231	14.26460	0.1203
At most 4	0.000212	0.007217	3.841466	0.9319

Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

INFLSA	INFLNA	INFLLE	INFLBO	INFLSW
-0.016313	0.218916	-0.085761	-0.019597	-0.289686
0.025625	0.162082	0.239787	-0.068644	0.006899
0.020570	0.189075	-0.045072	0.517863	0.103292
0.007526	0.006938	0.076935	0.369908	-0.235758
-0.043083	-0.114650	0.019389	-0.186937	-0.098530

Unrestricted Adjustment Coefficients (alpha):

D(INFLSA)	0.922186	-0.801968	-0.266513	0.689893	0.076247
D(INFLNA)	-2.519625	-2.459660	-0.896030	1.705291	-0.012656
D(INFLLE)	3.117790	-4.674371	1.417266	-1.361701	-0.001271
D(INFLBO)	0.410132	-0.357781	-0.910880	-0.630160	0.004577
D(INFLSW)	2.251673	-0.901929	-0.559707	1.491607	-0.008328

1 Cointegrating Equation(s):	Log likelihood	-475.0650

Normalized cointegrating coefficients (standard error in parentheses)

INFLSA	INFLNA	INFLLE	INFLBO	INFLSW
1.000000	-13.41959	5.257146	1.201321	17.75775
	(2.22031)	(1.76963)	(4.07164)	(2.61059)

Adjustment coefficients (standard error in parentheses)

D(INFLSA)	-0.015044
	(0.01739)
D(INFLNA)	0.041103
	(0.01599)
D(INFLLE)	-0.050861
	(0.02305)
D(INFLBO)	-0.006691
	(0.00636)
D(INFLSW)	-0.036732
	(0.01094)

2 Cointegrating Equation(s):	Log likelihood	-460.6709

Normalized cointegrating coefficients (standard error in parentheses)

INFLSA	INFLNA	INFLLE	INFLBO	INFLSW
1.000000	0.000000	8.043945	-1.435802	5.871569
		(1.22099)	(2.71815)	(1.52621)
0.000000	1.000000	0.207667	-0.196513	-0.885734
		(0.12020)	(0.26758)	(0.15024)

Adjustment coefficients (standard error in parentheses)

D(INFLSA)	-0.035594	0.071897
	(0.03203)	(0.28722)
D(INFLNA)	-0.021926	-0.950253
	(0.02607)	(0.23375)
D(INFLLE)	-0.170643	-0.075095

	(0.03311)	(0.29688)
D(INFLBO)	-0.015859	0.031795
	(0.01166)	(0.10455)
D(INFLSW)	-0.059844	0.346742
	(0.01967)	(0.17637)

3 Cointegrating Equation(s):	Log likelihood	-453.3150

Normalized cointegrating coefficients (standard error in parentheses)

INFLSA	INFLNA	INFLLE	INFLBO	INFLSW
1.000000	0.000000	0.000000	17.38798	10.70147
			(4.55409)	(2.61810)
0.000000	1.000000	0.000000	0.289451	-0.761043
			(0.23183)	(0.13328)
0.000000	0.000000	1.000000	-2.340118	-0.600439
			(0.61893)	(0.35581)

Adjustment coefficients (standard error in parentheses)

D(INFLSA)	-0.041076	0.021506	-0.259377
	(0.03864)	(0.34922)	(0.27238)
D(INFLNA)	-0.040357	-1.119670	-0.333323
	(0.03084)	(0.27875)	(0.21741)
D(INFLLE)	-0.141490	0.192875	-1.452115
	(0.03871)	(0.34990)	(0.27291)
D(INFLBO)	-0.034595	-0.140430	-0.079910
	(0.01253)	(0.11323)	(0.08831)
D(INFLSW)	-0.071357	0.240915	-0.384149
	(0.02342)	(0.21171)	(0.16512)

4 Cointegrating Equation(s):	Log likelihood	-447.4389

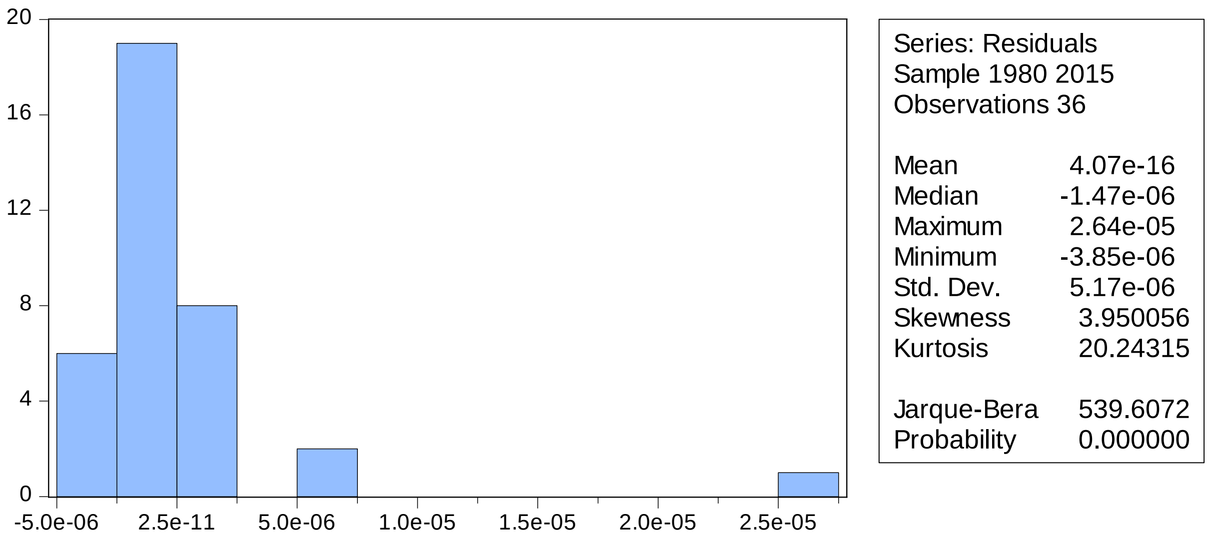
Normalized cointegrating coefficients (standard error in parentheses)

INFLSA	INFLNA	INFLLE	INFLBO	INFLSW
1.000000	0.000000	0.000000	0.000000	21.74190
				(4.11909)
0.000000	1.000000	0.000000	0.000000	-0.577257
				(0.13651)
0.000000	0.000000	1.000000	0.000000	-2.086288
				(0.53563)
0.000000	0.000000	0.000000	1.000000	-0.634946
				(0.19735)

Adjustment coefficients (standard error in parentheses)

D(INFLSA)	-0.035884	0.026292	-0.206300	0.154157
	(0.03913)	(0.34651)	(0.28191)	(0.66910)
D(INFLNA)	-0.027523	-1.107839	-0.202127	0.384999
	(0.02898)	(0.25668)	(0.20883)	(0.49564)
D(INFLLE)	-0.151738	0.183428	-1.556877	0.490012
	(0.03828)	(0.33901)	(0.27581)	(0.65461)
D(INFLBO)	-0.039338	-0.144802	-0.128391	-0.688290
	(0.01195)	(0.10587)	(0.08613)	(0.20443)
D(INFLSW)	-0.060131	0.251263	-0.269392	0.279690
	(0.02136)	(0.18914)	(0.15388)	(0.36522)

EXCHANGE RATE



Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.657347	Prob. F(4,31)	0.6262
Obs*R-squared	2.814739	Prob. Chi-Square(4)	0.5893
Scaled explained SS	20.08180	Prob. Chi-Square(4)	0.0005

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/17/15 Time: 20:23
Sample: 1980 2015
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	3.80E-10	3.15E-10	1.205543	0.2371
XRATESA	-1.43E-12	1.58E-12	-0.904859	0.3725
XRATELE	-4.83E-13	1.11E-12	-0.433359	0.6678
XRATEBO	-3.92E-11	4.45E-11	-0.879621	0.3858
XTRATENA	3.62E-12	1.86E-11	0.194156	0.8473

R-squared	0.078187	Mean dependent var	2.60E-11
Adjusted R-squared	-0.040756	S.D. dependent var	1.16E-10
S.E. of regression	1.18E-10	Akaike info criterion	-42.75210
Sum squared resid	4.33E-19	Schwarz criterion	-42.53217
Log likelihood	774.5378	Hannan-Quinn criter.	-42.67534
F-statistic	0.657347	Durbin-Watson stat	2.014572
Prob(F-statistic)	0.626222		

Heteroskedasticity Test: ARCH

F-statistic	0.068142	Prob. F(1,33)	0.7957
Obs*R-squared	0.072122	Prob. Chi-Square(1)	0.7883

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/17/15 Time: 20:24
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.54E-11	2.07E-11	1.230767	0.2271
RESID^2(-1)	0.045404	0.173937	0.261039	0.7957

R-squared	0.002061	Mean dependent var	2.66E-11
Adjusted R-squared	-0.028180	S.D. dependent var	1.17E-10
S.E. of regression	1.19E-10	Akaike info criterion	-42.80908
Sum squared resid	4.68E-19	Schwarz criterion	-42.72020
Log likelihood	751.1589	Hannan-Quinn criter.	-42.77840
F-statistic	0.068142	Durbin-Watson stat	2.004263
Prob(F-statistic)	0.795684		

Ramsey RESET Test
Equation: UNTITLED
Specification: XRATESW XRATESA XRATELE XRATEBO XTRATENA C
Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	0.290129	30	0.7737
F-statistic	0.084175	(1, 30)	0.7737
Likelihood ratio	0.100868	1	0.7508

F-test summary:

	Sum of Sq.	Df	Mean Squares
Test SSR	2.62E-12	1	2.62E-12
Restricted SSR	9.37E-10	31	3.02E-11
Unrestricted SSR	9.34E-10	30	3.11E-11
Unrestricted SSR	9.34E-10	30	3.11E-11

LR test summary:

	Value	Df
Restricted LogL	387.6097	31
Unrestricted LogL	387.6601	30

Unrestricted Test Equation:
Dependent Variable: XRATESW
Method: Least Squares
Date: 05/17/15 Time: 20:24
Sample: 1980 2015
Included observations: 36

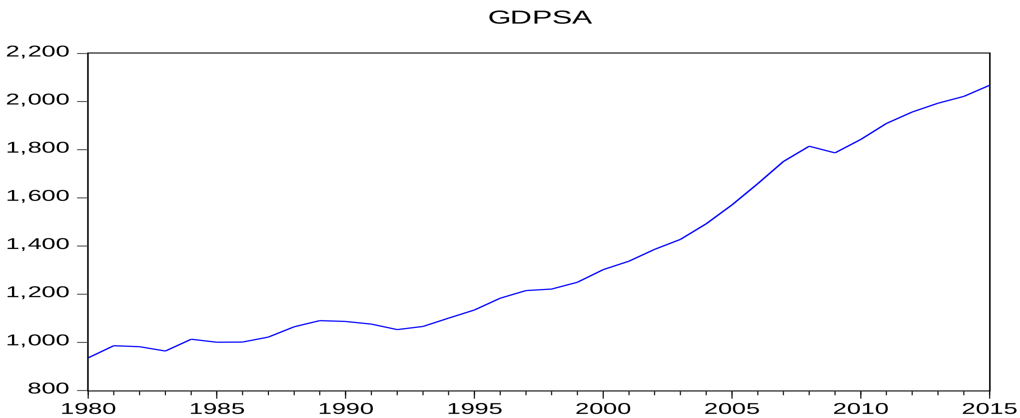
Variable	Coefficient	Std. Error	t-Statistic	Prob.
XRATESA	-4.94E-08	9.03E-08	-0.546634	0.5887
XRATELE	-9.22E-09	5.33E-08	-0.173053	0.8638
XRATEBO	-2.16E-06	2.39E-06	-0.903561	0.3734
XTRATENA	1.000001	1.92E-06	519485.3	0.0000
C	1.22E-05	1.68E-05	0.730128	0.4710
FITTED^2	-1.81E-08	6.24E-08	-0.290129	0.7737

R-squared	1.000000	Mean dependent var	7.606107

Adjusted R-squared	1.000000	S.D. dependent var	4.826453
S.E. of regression	5.58E-06	Akaike info criterion	-21.20334
Sum squared resid	9.34E-10	Schwarz criterion	-20.93942
Log likelihood	387.6601	Hannan-Quinn criter.	-21.11123
F-statistic	5.23E+12	Durbin-Watson stat	1.459886
Prob(F-statistic)	0.000000		

Figure 5.2.1 Graphical presentation of GDP at levels for South Africa

Levels



Years

Figure 5.2.2 Graphical presentation of exchange rate at levels

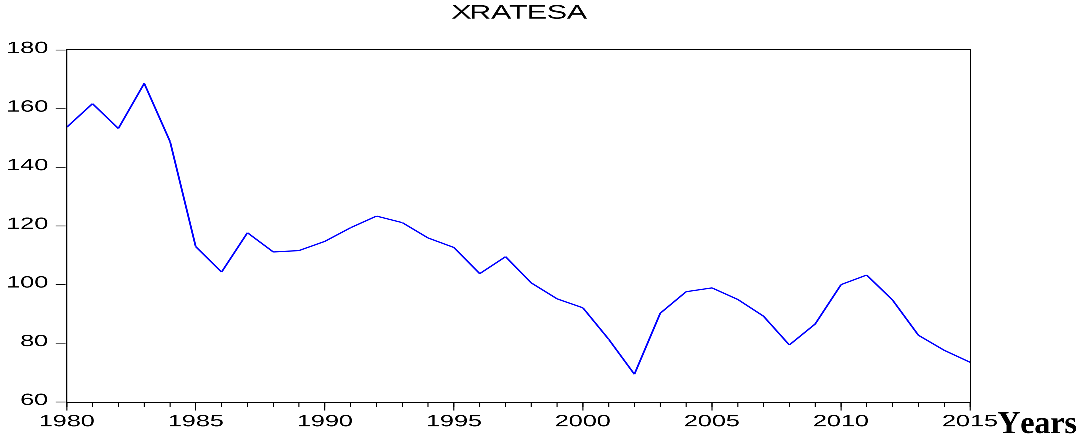
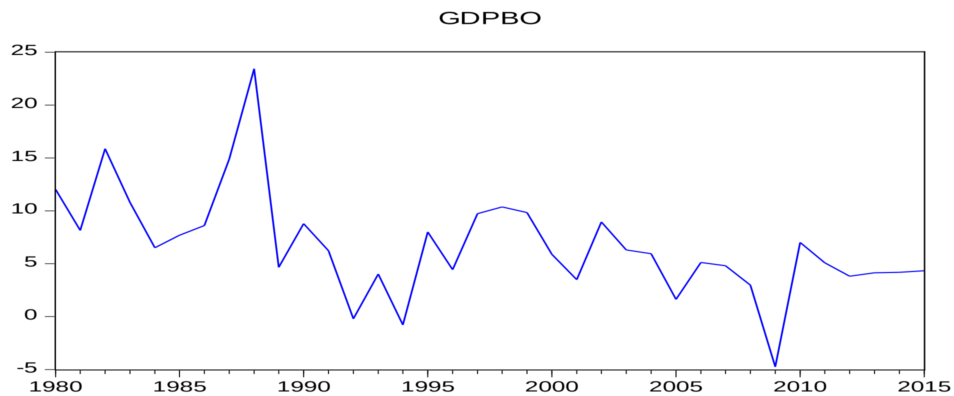

XRATESA
180
160
140
120
100
80
60
1980
1985
1990
1995
2000
2005
2010
2015
Years

Figure 5.2.3 Graphical presentation of GDP at levels for Botswana

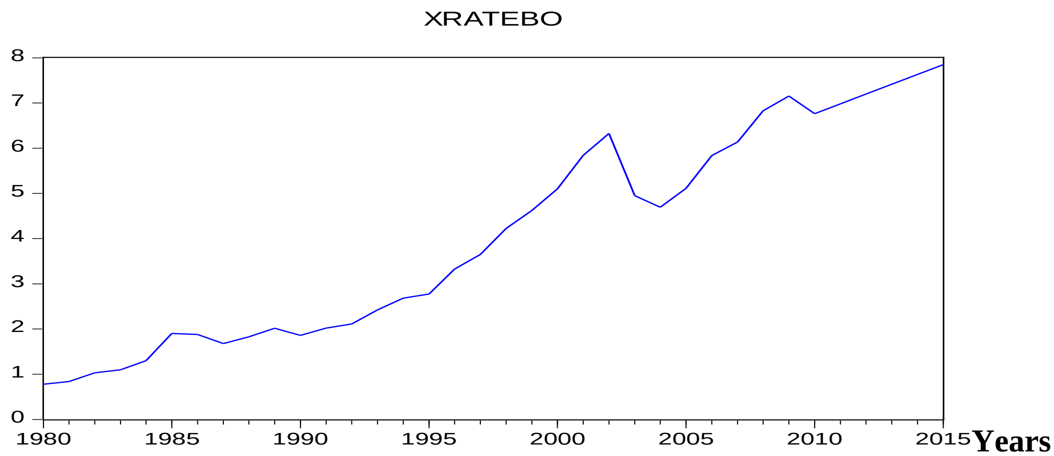
Levels



Years

Figure 5.2.4 Graphical presentation of exchange rate at levels

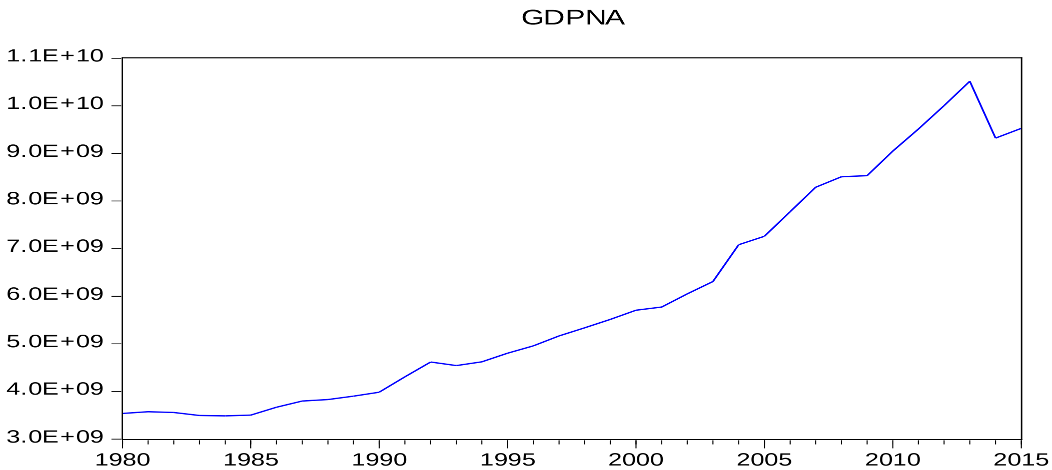
Levels



Source: Eviews 8 (2015)

Figure 5.2.5 Graphical presentation of GDP at levels for Namibia

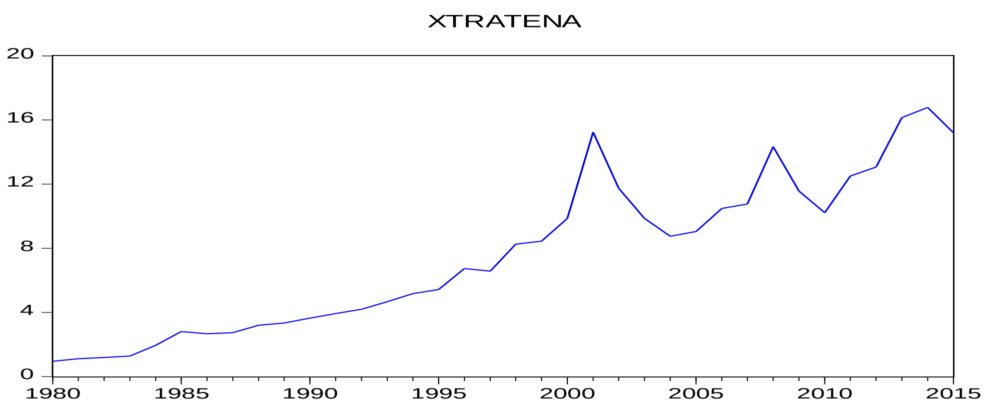
Levels



Years

Figure 5.2.6 Graphical presentation of exchange rate at levels

Levels



Years

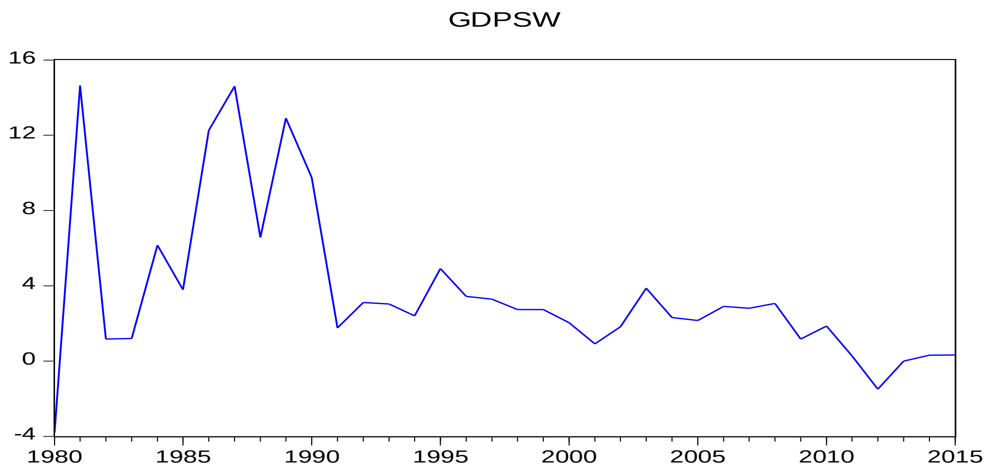
Source: Eviews 8(2015)

The figure above figure 5.2.5 shows the graph that represents GDP Namibia in levels and suggests that the variable is non-stationary. The second figure 5.2.6 for levels shows a non-stationary shape.

Figure 5.2.7 below is the visual inspection of the data on GDP Swaziland at levels. The variable in levels the series is stationary. The plot of the same variable on figure 5.2.8 in levels of the series shows non-stationary shape.

Figure: 5.2.7 Graphical presentation of gross domestic product at levels Swaziland

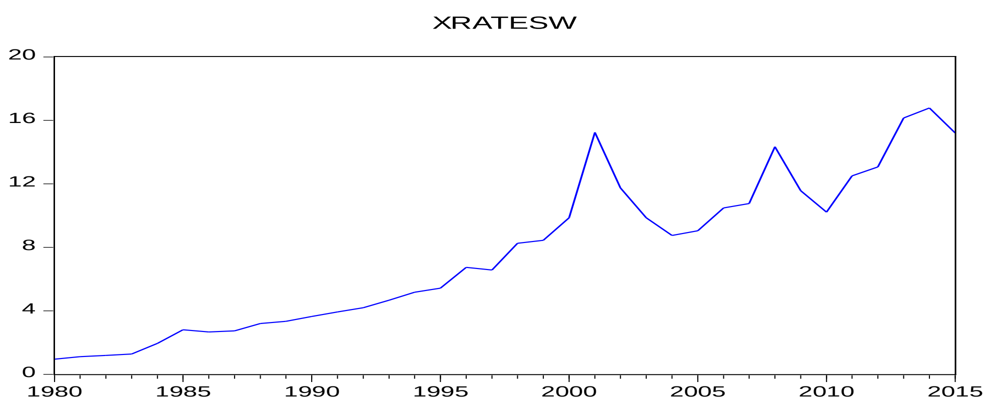
Levels



Years

Figure: 5.2.8 Graphical presentation of exchange rate at levels

Levels

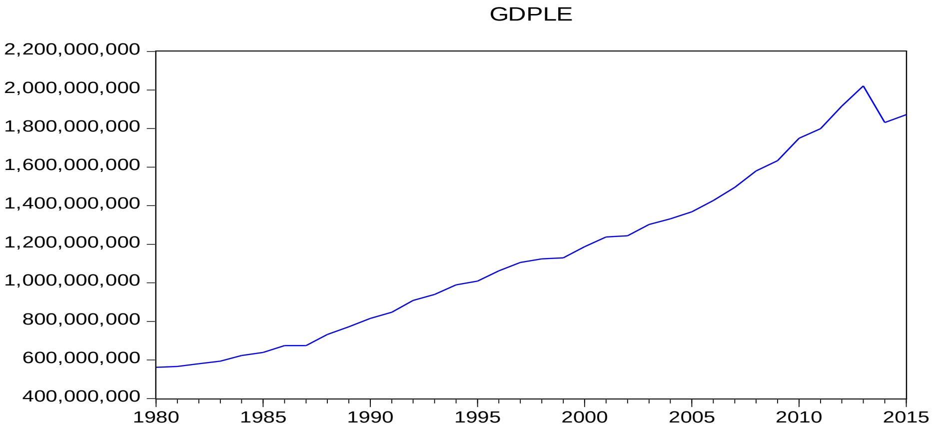


Years

Source: Eviews8 (2015)

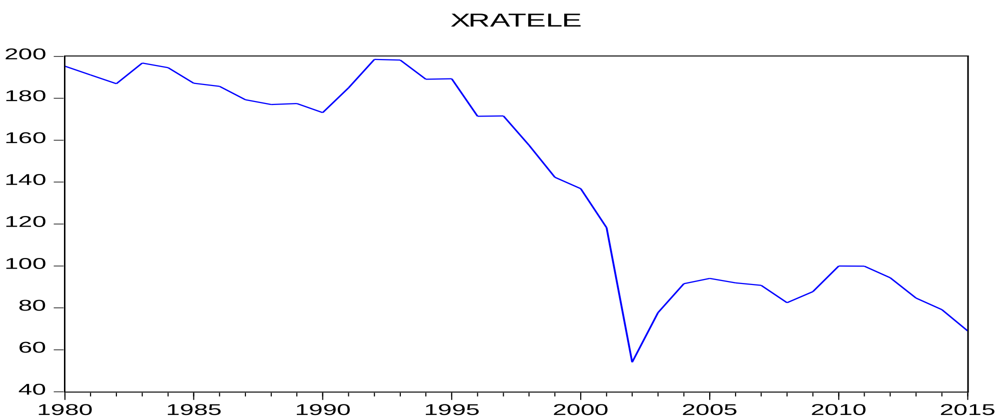
Figure: 5.2.9 Graphical presentation of GDP at levels for Lesotho

Levels



Years

Figure: 5.2.10 Graphical presentation of exchange rate at levels



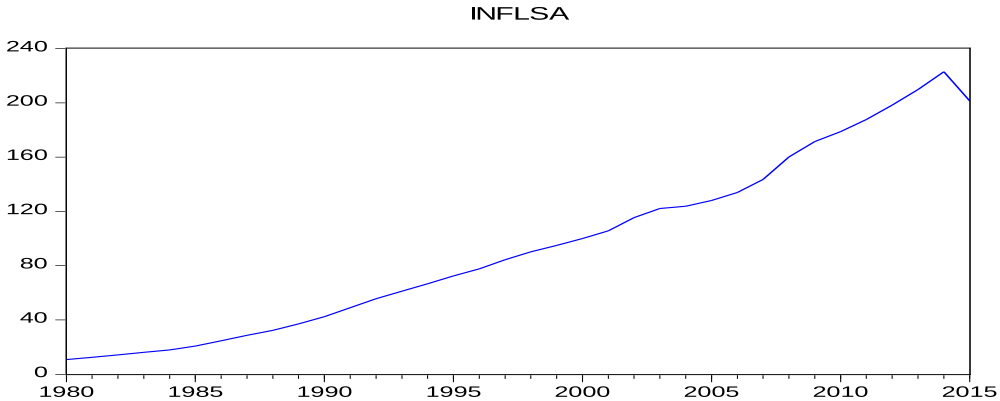
Years

Source: Eviews 8 (2015)

The figure above figure 5.2.9 shows the graph that represents GDP in levels and suggests that the variable is non-stationary. The second figure 5.2.10 for levels shows a more non-stationary shape.

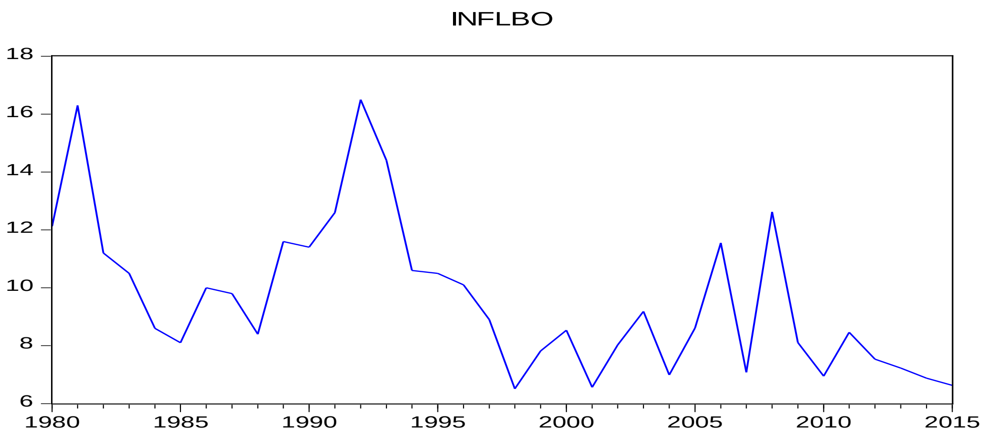
Figure: 5.2.11 Graphical presentation of INF at levels South Africa

Levels



Years

Figure: 5.2.12 Graphical presentation of INF at levels, Botswana



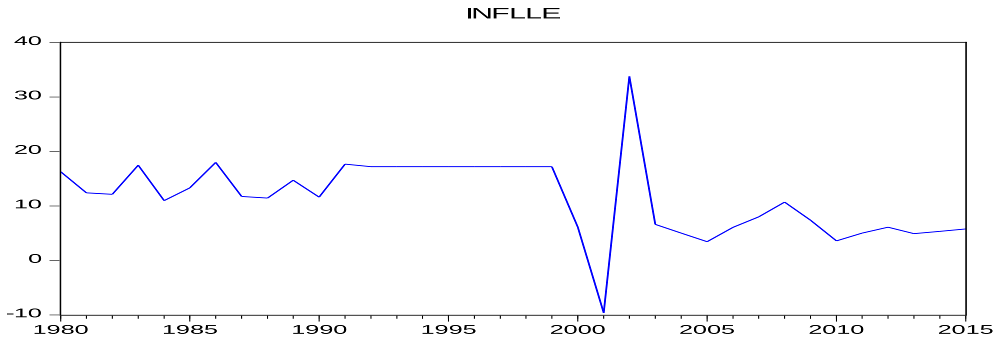
Years

Source: Eviews 8 (2015)

The figure above figure 5.2.11 shows the graph that represents inflation rate (CPI) in levels and suggests that the variable is non-stationary. The second figure 5.2.12 for levels shows a more stationary shape, it indicates that the data in this form might be stationary.

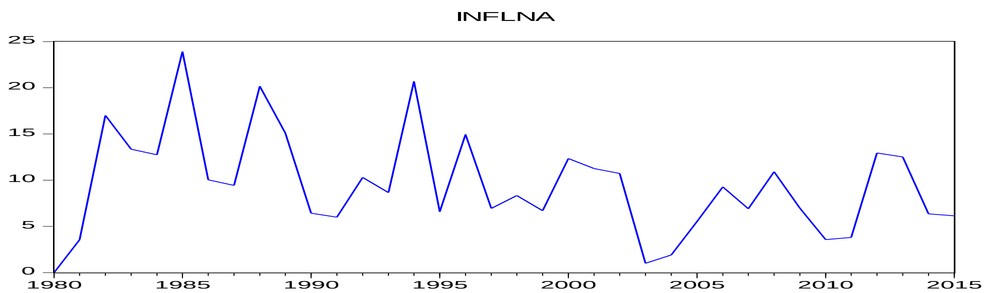
Figure: 5.2.13 Graphical presentation of INF at levels, Lesotho

Levels



Years

Figure: 5.2.14 Graphical presentation of inflation rate at levels, Namibia



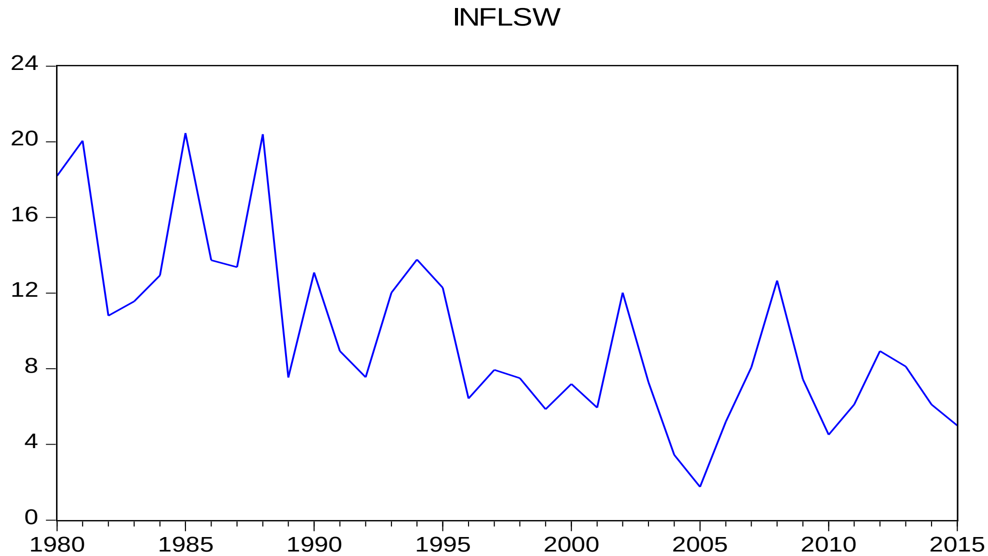
Years

Source: Eviews 8 (2015)

The figure above figure 5.2.13 shows the graph that represents CPI in levels and suggests that the variable is stationary. The second figure 5.2.14 for levels shows a more stationary shape, it indicates that the data in this form might be stationary for Namibia and Lesotho.

Figure: 5.2.15 Graphical presentation of INF at levels, Swaziland

Levels



Years

Source: Eviews 8 (2015)

The figure above figure 5.2.15 shows the graph that represents CPI in levels and suggests that the variable is stationary.