Comparing Co-integration, Co-breaking and Modified R

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CERTIFICATE

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List of Abbreviations

Abbreviations	***Complete name***
ECM	*Error Correction Model*
DGP	*Data generating Process*
EG	*Engle and Granger*
MR	*Modified R*
UK	*United Kingdom*
GNP	*Gross National Product*
OLS	*Ordinary least Square*
EY	*Engle and Yoo*
JJ	*Johansen and Juselius co-integration*
ARDL	*Auto regressive distributed lag*
I(0)	*Integrated of order Zero*
I(1)	*Integrated of order one*
GH	*Gregory and Hansen*
ADF	*Augmented Dickey fuller test*
KPSS	*Kwiatkowski–Phillips–Schmidt–Shin tests*
VAR	*Vector autoregressive*
ART	*Atheoretical Regression Trees*

US	*United State*
PO	*Phillips and Ouliaris*
WT	*World trade*
DW	*Durbin-Watson*
CI	*Co-integrated*
WDI	*World Development Indicator*
GDP	*Gross Domestic Product*
AIC	*Akaike Information criterion*
BIC	*Bayesian Information criterion*
IID	*Independent and identically distributed*
CB	*Co-breaking*

This dissertation is dedicated to

My Parents, My Uncle Siddiq Hassan,

My Beloved Brothers & Sisters.

(For their endless Love, support, Prayers and encouragement)

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ABSTRACT

Modelling non-stationary is one of the most debated problems in time series econometrics. Several kinds of methodologies are developed in the literature to examine the relationship between time series variables. These tests are compared on the basis of their size and power characteristics using Monte Carlo experiments. In the literature, variety of comparison of tests were carried out on the basis of size and power properties. No previous studies have compared co-integration and co-breaking in term of size and power using real economic data. In this study, comparison of three different econometric techniques i.e. Co-integration, co-breaking and Modified R are carried out while applying to real data. This study also evaluates the performance of these three techniques to distinguish between genuine and spurious relationship taking consumption and income real data of 44 countries.

Moreover, we calculate the size and power because size portrays the probability of spurious relationship between consumption and income of two different countries While calculation of power denotes the probability of genuine relationship between income and consumption of same countries. Finally, the estimated results are interpreted in three different scenarios. Firstly, if our focus is to minimize the size distortion then Engle and Granger co-integration is best one as it shows 7.88% size distortion. Secondly, the Size distortion of Johansen and Juselius and MR are approximately equal and comparable So when we compared these two tests MR show better performance as their Power is greater than JJ. Thirdly, we calculated the operational power for each test. On the basis of operational power, we concluded that MR is best tests Which show better performance in our analysis as compare to remaining tests

Chapter 1:

INTRODUCTION

1.1. Background

Modeling non-stationary is one of the highly debated issues in time series analysis. It is observed that most of economic time series data are non- stationary. Granger and Newbold (1974) found that regression of two non-stationary time series produces spurious results. On the other hand, Nelson and Plosser (1981) found that most of the time series are better to modeled as non-stationary. This finding altered the view point of conventional econometrics and showed a new direction to econometric research. The theory of non-stationary time series developed very rapidly after these findings. Mapping of a macroeconomic time series to stationarity could be achieved without exogenous deterministic factors and differencing but this causes loss of alternatively long run information. Today, we have three kinds of methodologies which can distinguish between genuine and spurious relationship. First one is the co-integration which is the most common practice is to differentiate between genuine and spurious relationship. Co-integration modelling and associated error correction model (ECM) provide opportunity to model non-stationary time series without loss of long run information. An alternative way to differentiate the genuine and spurious relationship is co-breaking. The co-breaking does not require unit root testing. The concept of Co-breaking was introduced by Hendry (1996) who has done the analysis of system of equations. He defines co-breaking as the removal of deterministic structural breaks across linear combination of variables.

The 2nd alternative mechanism to differentiate between genuine and spurious relationship is to use Modified R technique, proposed by Rehman and Malik (2014), which also does not require unit root testing.

Co-integration analysis is the most popular way to model non-stationary series. Unfortunately, the co-integration is applicable only to non-stationary series. On the other hand, Granger et al (1998) have shown that spurious regression can also be found in stationary series. In such situation, co-integration analysis will fail to provide the solution to spurious regression. Rehman and Malik (2014) developed Modified R technique which perform well to differentiate genuine and spurious relation. Rehman and Malik (2014) claim that MR is robust to the strength of autocorrelation, type of stationarity and type of deterministic part in the DGP of time series.

Therefore, we have three methodologies having potential to differentiate among genuine and spurious relation. But comparison of these techniques is not done. In the existing literature; usually the econometric tests are evaluated in term of size and power properties through Monte Carlo simulations. On the basis of their size and power properties these tests are compared and evaluated, but no conclusive answer could be achieved that which test performs better as compared to other tests on the basis of size and power properties. Each test has its own domain of deficiency and strength depending on different characteristics of underlying data. Almost all of the existing comparison of the tests were carried out on the basis of Monte Carlo simulations, the design of the Monte Carlo methods supports the implicit assumptions. Whereas for real data the validity of these implicit assumptions is not necessary. In real data, the DGP is unknown so comparison becomes implausible. But purpose of this exercise is to differentiate genuine and spurious relationship using real data. Usually, it is not possible to compare the tests on those real data series because we don't know in advance the nature of true relationship between them. However, real time data on Consumption and Income provide us an opportunity to compare these three tests. There are very strong theoretical reasons to believe that the two variables should be co-integrated for the same country and there should be genuine relationship, whereas for different countries there is

confirmation of no relationship. If the results show a relationship of consumption and income among different countries, then this relationship will be spurious. All existing studies in literature agree that consumption and income of same country have strong relationship. Hansen (1947) studied that consumption is a function of income in the long as well as the short run. Davidson et al (1978), Soytas, U., & Sari, R. (2003) and Khan and Ahmed (2014) also studied like this. On the other hand, there is no single study to say that consumption is not related to income. All theories of consumption function treat the income as major determinant of consumption such as Keynesian consumption function theory. This is why we believe that consumption and income are related theoretically. There is no theory to relate consumption and country 'X' with income of country 'Y' that's why we assume that the consumption and income of two different countries should not be related. On contrary, many economists have cited the regression of two different countries as spurious regression. By applying techniques to time series data on consumption and income of 44 countries, we can find the relative merits of three techniques. In this study three methodologies; co-integration analysis, co-breaking and modified R to differentiate between genuine and spurious relation, are to be compared by comparing their performance on real data.

1.2. Objective of the study

The objective of the study is to measure the performance of methodologies differentiating between genuine and spurious relation. These methodologies include co-integration, co-breaking and Modified R, this performance comparison is based on real time series data.

1.3. Motivation

Most of the time series data is expected to exhibit spurious regression and most popular technique to avoid spurious regression is co-integration analysis. Co-integration analysis is applicable to non-stationary series, but it is shown by Granger (1998) that spurious regression can exist in stationary

series as well. Therefore, co-integration analysis cannot provide solution to spurious regression if the underlying series are stationary. Two alternative strategies to differentiate between genuine and spurious relation are co-breaking and modified R. But there is no comparison of these three techniques on real time series which can guide in choice of most appropriate technique. This study will fill this gap.

1.4. Significance of the study

We have many ways to test the relationship between time series and practitioner may confuse between them, because there is no such comparison exist in literature. This study designed to develop a comparison of these tests by equating the number of times a test captures true (strong) long-run relationship to the number of times a test captures spurious co-integration (long-run relationship), when applied to real time series data on Consumption (C) and Income (Y) of forty-four countries. This study will facilitate the researcher and practitioners about relative merits of three procedures.

1.5. Organization of the study

In chapter 1, we discuss introduction, objective, motivation and significances of the study. Further in our study, chapter 2 is brief review of literature and the detail of test which are compared in this study. In chapter 3 the methodological framework is discussed. Whereas chapter 4 includes results and discussion. In chapter 5 summary and conclusion are drawn based on the statistical evidences from chapter 4 and recommendation is given to researchers. References and appendix are provided for more help.

Chapter: 2

LITERATURE REVIEW

Review of Literature

In this section we briefly discuss the proposed theoretical and empirical methods and the literature review is arranged as follows.

2.1. The Challenge of Spurious Regression

There is long historical discussion in econometrics literature on modeling non- stationary series. The idea of fake or spurious regression has the history almost as long as the history of econometrics itself. Yule (1926) observed spurious regression, that is if two, or more time series have actually no relation between them but the regression between these time series appears to be highly significant. Yule (1926) found a strong correlation of 0.95 between proportion of Church of England marriages to all marriages and rate of mortality during 1866-1911.

2.2. Granger and Newbold's Experiments

Granger and Newbold (1974) found that regression of two non-stationary time series produced spurious results. They created independent autoregressive series in their experiment such as X_t and Y_t, both are presented by their own lag values. There is no further variable is involved in the foundation of both variables. They firstly regress X_t on Y_t and then, they turn up with spurious results. The spurious regression gives misleading statistical indication of significant relationship although the variables are independent.

2.3. Some Famous Examples of Spurious regression

Hendry (1980) showed a spurious correlation using rainfall in UK and Price level. Plosser and Schwert (1982) claimed that, nonsense results are possibly produce when we run the regression of two non-stationary series without taking their difference. The nominal economic series are mostly

associated even there is no relationship between them. It was also shown that many time series are non-stationary that's why the probabilities of spurious regression are very high. Roger and Jupp (2006) portrayed an example of spurious positive relationship between human baby's birth and stork nesting in the classification of spring, because these two variables are associated to a third variable. According to the Roger and Jupp (2006) the classification of Dutch statistics is showing a positive relationship between stork nesting in the classification of spring and human baby's birth at that time, it is due to that the both variables are associated to the state of weather. It means that both variables are independent, but they have relation with the state of weather. This shows that both variables are spuriously correlated because of third missing variable. According to the Hofer et al. (2004) this spurious correlation is due to lack of statistical information.

2.4. Nelson and Plosser's experiment

The work by Nelson and Plosser (1982) is usually considered the starting point of a vast amount of research on unit roots in macroeconomic time series. They use long historical time series of annual data for 14 variables for the US economy including GNP, wage, employment, prices, stock prices and interest rate. Nelson and Plosser (1982) studied sample autocorrelations and test for the presence of unit roots in these time series variables. They found that 12 out of 14 series were having unit root. In fact, Nelson and Plosser (1982) study is a noteworthy contribution in time series econometric literature which improved the interest of researchers in unit root tests. That's why it has created the development in the unit root theory. Combining the findings of Granger Newbold (1974) and Nelson and Plosser (1982) conclusions can be drawn that regression of most of the time series make spurious results.

2.5. Post Nelson and Plosser development and Concept of Co-integration

The most important development in Post Nelson and Plosser literature is the idea of co integration. The concepts of co-integration can be summarized as follows: Suppose We have two series X_t and Y_t both of which are I (1), we run the simple regression and store the residual. There linear combination Z_t = aX_t + bY_t would also be I (1) in general. Then in this case there is no co-integration exist. However, for some pairs of series it is possible to find out a, b such that Z_t = aX_t + bY_t is I (0), In this case co-integration is exist.

2.6. Test for co-integration

In the below section we will discuss the residual based tests and system based co-integration test which are as follows.

2.6.1. Residual based tests

These tests having following kind of structure; Estimate a static regression, obtaining the residual series from static regression and applying unit root test for residual series. These tests include Engle and Granger (1987), Engle an Yoo (1987) and Philips and Ouliaris (1990) etc. Engle and Granger (1986) prove that every cointegrating relationship has an error correction mechanism. This is usually called Granger representation theorem. Therefore, for the system with non-stationary I (1) variables, Engle and Granger proposed a procedure to test for co-integration and to construct an error correction. The procedure is known as Engle and Granger 2 step procedure.

It is proved that in the presence of co-integration relationship the OLS gives consistent estimates for all the parameters (stock, 1987). Engle and Yo (1987) found correct critical value for ADF test.

In Engle and Granger co-integration test, it is assumed that there is only one co-integration relationship between the variables. It does not tell us the correct number of long run relationship

among variables when we have more than two variables. Engle and Yo (1991) suggest a three-step estimation method to overcome two main drawbacks of the classical Engle and Granger two step procedure. The two major faults of the EG methods are: i) although the long-run static regression gives consistent estimates, they may not be fully efficient, ii) due to non-normality of the distribution of the estimators of the cointegrating vector, no sensible judgment can be made about the significance of the parameters. The third step corrects the parameter estimates of the first step so that standard tests, such as t-test, can be applied (Engle and Yoo (1991), Cuthbertson *et al.* (1992)). Phillips and Ouliaris (1990) proposed residual based tests under the null hypothesis of no co-integration in time series. In which the asymptotic distributions of residual based tests depend upon number of variables and deterministic trend terms. In case when we have more than two variables then there is a chance of more than one vector of co-integration. In this case EG and EY failed to provide a solution for this problem**.**

2.6.2. System based Test

These tests are based on multiple equations instead of single equation. These tests include JJ, ARDL bound test etc. JJ being the first test in this stream. These tests are capable of finding more than one critical values. Also, these tests do not require distinction of endogenous or exogenous variables. Johansen and Juselius (1992) introduced a test that allows to find out more than one cointegrated vector. When the relationship is estimated, the Engle Granger single equation procedure ignore the short run dynamics whereas the JJ procedure considers the short run dynamics. JJ test empowers to determine more than one cointegrating vector. Charemza and

Deadman (1993) recognized that JJ test is more powerful as compare to EG in term of statistical properties. Trace statistics (TS) and maximum eigenvalue (ME) are used in Johansen (1988) and JJ (1990) to evaluate whether there is long run relationship between variables. ME is taken better as compare to TS, as ME value provides more reliable findings. Regardless of its theoretical benefits and superiority, the Johansen estimating procedure is, in practice, also subject to some deficiencies. First, given the small sample size, the method cannot be known as suitable one since the point estimates attained for cointegrating vector may not be mostly meaningful. Second, some added problems happen if we do not have a limited cointegrating vector. The problem of multiple long-run relationship is apparently best seen as an identification problem (Granger (1986)), and can be resolved in, essentially, two ways: either rejecting all but one such cointegrating vectors as economically meaningless or if the model is reliable with the underlying economic theory, it should consist of not one but two or more single equations. In this respect, Phillips and Loretan (1991) favor for the use of equation-by-equation approach of the single-equation ECM since such a possibility is not available in complete systems-methods such as the Johansen approach.

2.6.3. ARDL type tests

Pesaran et al. (1996) and Pesaran (1997) proposed a single equation ARDL technique for co-integration as an alternative of Engle and Granger. This technique can be used irrespective of whether the underlying variables are I (0), I (1) or combination of both. The ARDL model of the co-integrating vector is reparametrized to ECM if one co-integrating vector is identified. The results give shorts –run dynamics as well as long relationship between the variables of a single model. When there is single long run relationship, the ARDL technique can be differentiate between dependent and explanatory variables. The ARDL technique assumes that only a single reduced form equation relationship exists between the dependent variable and the exogenous

variables (Pesaran, Smith, and Shin, 2001). Davidson et al. (1978) proposed ARDL methodology to model the UK consumption function. Ghouse et al (2018) concluded in their study that the missing variables are the main cause of spurious regression. They suggest that ARDL model can be used as a remedy of spurious regression. Johansen's method employs the trace test and maximum eigenvalues to test for the existence of one or more co-integrating vectors in the data set. This procedure is used mostly on multivariate data sets where we suspect the existence of more than one co-integrating relationship. However, it can also be used to verify the results of other co-integration techniques. This method assumes that the co-integrating vector is constant during the period of study.

2.6.4. Some Alternative Approaches

In reality, it is possible that the long-run relationships between the underlying variables change because of changes in technological progress and /or economic crises. In order to remedy this limitation, GH (1996) have introduced tests for co-integration with one unknown structural break(s). GH tests allow the null hypothesis of no co-integration with structural breaks among the variables of I (1). It is an extension of EG (1987). The standard EG co-integration only find the long-run relationship between the variables and doesn't consider the break point. To incorporated such issues tests have been introduced for co-integration. GH test can be used when there is one unknown structural break. GH (1996a) and Gregory, Nason and Watt (1996) determine that ignoring prevailing breaks in the co-integrating relationship among a set of nonstationary variables results in power loss of standard residual-based co-integration tests such as those of EG (1987) and PO (1990). In this model the co-integrating vector are allowed to change at single unknown time. In this situation, the standard ADF tests for co-integration are not reliable, as it assumes that cointegrating vector is time invariant. So standard ADF may not reject the null hypothesis and the

researcher will incorrectly conclude that there is no long run relationship. So, they proposed to use Hansen (1992) ADF* which are useful to determine whether the cointegrating relationship has been subject to regime shift. GH (1996b) built three statistics for those test: ADF*, $Z_\alpha *$ and $Z_t *$.Gregory et al. (1996) illustrated and identify the problems with standard co-integration in the presence of breaks. the break yields spurious unit roots in the cointegrating relationship due to which the rejection of null hypothesis of no co-integration is difficult. Julia Campos et al (1996) found that the breaks has little effect on the size of the co-integration tests however the break does affect the power of co-integration tests when the process generating the data does not have a common factor. Hatemi–J test (2006) test is for when we have two unknown breaks, then we use this test.

Other Solutions

In this section we discuss alternative mechanism which are used to differentiate the genuine and spurious relationship.

2.7. Co-breaking

Co-breaking concept was given by Hendry (1996). He considers non-stationarities arise due to unit roots and structural breaks. As the co-integration eliminate unit roots from linear combination of variables (Engle and Granger 1987), Hendry introduced a similar concept, called co-breaking, for system with structural break. It removes the deterministic structural breaks across linear combination of variables. As the co-breaking play an important role in modeling the set of series subject to structural break. The co-breaking regression procedure is applied in two steps. Firstly, test whether a given vector of variables is subject to break. Secondly, examine whether the shifts disappear in a linear combination of variables. This process is used to estimate the co-breaking relationships with known number of relationship. Chapman and Ogaki (1993) modeled

the unconditional process x_t, assume the deterministic term to be represented by a Piecewise trend Polynomial. Hendry and Mizon (1998) considered a VAR model of x_t, used impulse and step dummies to model location shifts. Finally, Morana (2002), Markov-switching model. Hendry and Dormik (997), show that breaks seem the main source of forecast biases. A Challenge arise in the literature to identify the multiple structural breaks occur at unknown date. To overcome this problem Cappelli and Reale (2005) proposed a procedure, ART, to identify the breaks in the mean. Hendry and Mizon (1998) analyze the long-run relationship between Interest rate and velocity of money in UK. They found co-breaking between the interest rate and velocity of money in UK. Hendry suggested idea of co-breaking rank as the number of linear combinations of the variables that no longer display the breaks. In the literature only three procedures have been suggested to estimate the co-breaking rank. Bierens (2000) developed system test, after that in Krolzig and Toro (2002) introduced reduced rank technique to estimate the number of linear combinations that cancel the deterministic components based on a vector autoregressive model. Sven Schreiber (2009) used reduced rank technique to estimate the long-run relationship between US labor productivity growth and unemployment. Using quarterly data with a sample range from 1950-3 to 2003-3. This test found shift around 1974, 1986 and 1996 and implied the long run between the variables is negative. Hatanaka and Yamada (2003) suggested a parametric procedure for testing for the co-breaking as well as co-integrating rank in a segmented trend model. Testing co-breaking play an important role in pursuing model reduction. Ahlgren, N., & Antell, J. (2010) suggested to use co-breaking for modeling and testing common movement between financial markets in times of crises. They find co-breaking between developed stock markets and find the evidence of co-breaking in emerging stock markets is mainly due to non-Financial Event of the WT Center terrorist attacks in September 11, 2001. Kurita, T. (2010) demonstrated that co-breaking removes

the deterministic shift caused by the collapses of the bubble economy in Japan in early 1990s. Josep Lluis Carrion-i-Silvestre at al (2011) proposed the likelihood ratio test for co-breaking which show better statistical properties when compare with the existing procedure in the literature.

2.8. Modified R

A Modified R (MR) which may use as a robust measure of association for time series proposed by Rehman and Malik (2014). Correlation coefficient is a popular statistic in classical econometrics since it provides quick idea of the strength of association among the two variables. However, it is strongly biased toward finding high correlation in time series even if the series are mutually uncorrelated. This phenomenon is called spurious correlation. To overcome this problem, Rehman and Malik (2014) proposed a new measure of association, MR, which is robust to type and strength of autocorrelation, type of stationarity and type of deterministic part in the DGP of the two series. It has very promising performance as for both stationary and non-stationary data. MR is an alternative test to distinguish between the genuine and spurious relationship. This does not require unit root testing.

Rehman and Malik presented MR as a descriptive and every descriptive can be used as a test statistic under certain condition. Descriptive can be used as tests if appropriate set of critical Values is available. Co-integration analysis can be used only for non-stationary series. However, Granger et al. (2001) found that spurious regression can also exist in stationary data. Rehman MR performs well in stationarity as well as non- stationary data.

2.9. Comparison

Co-integration tests constructed on different characteristics of underlying time series have been recognized in great variety in last three eras. The comparison of these tests was accomplished, which are based on the size and power properties. However, the study of comparisons did not

produce in definitive conclusion that out of different test which test has better performance than others. Banerjee, Dolado et al. (1986) evaluated the performance of co-integrating regression, DW test of co-integration and test of co-integration in a single equation ECM using size and power properties. In their study they used a DGP comprising 0 or 1 vector of co-integration and identified that single equation ECM show better performs as compared to co-integrating regression, DW test of co-integration in term of power. A comprehensive study on co-integration were carried out by Haug (1996). In which there are nine tests of co-integration are included in the study, the tests were split in to two categories belonging to single equation and system based. One with null hypothesis of no co-integration and other with null of co-integration. He found in his study that if the regressors are endogenous then Stock and Watson (1988) test of co-integration and PO (1990) test of co-integration perform better as compared to rest of the tests on the basis of power. The comparison of the study concluded that the null of no co-integration and alternative of co-integration were better performed as compared to null hypothesis of co-integration. It was also observed that normally tests based on single equation have slight size distortion as compared to system based tests. Compared three tests, Stock and Watson, Johansen co-integration test (based on ME statistics) and Bewley and Yang (BY 1995) test of co-integration. They studied the performance of these tests by taking 0 to 2 cointegrating vectors. They found that over a general range of parameters not a single test conquered other. Each test has a region where its performance is good but in alternative region its performance is bad and alternative test is performing very best there. In general comparison the Stock and Watson and Johansen ME statistics were powerful as compared to Bewley and Yang but in some cases Stock and Watson test showed severe size distortion issue. In one more study by Osterholm (2003), In this study he investigated performance of four famous co-integration test (such as Engle and Granger ADF, Johansen with ME statistics

(JME), Johansen with Trace statistics (JTS) and BY) in small sample. The DGP were used in which one most related variables from the system was omitted with one cointegrating vector. They found size distortion of four test. In this Monte Carlo study, the conclusion was drawn that JTS has very slight size distortion if the lag length in equation is selected through AIC and BIC. However, Pesavento (2004) compared the four tests by using analytical procedure and also through Monte Carlo methods. The tests which were chosen for this study are Engle granger ADF, t test for co-integration in a single equation ECM, Johansen Co-integration test based on JME statistics and BY. DGP containing only one cointegrating vector were used in this study and also used BIC as a lag selection criterion for suitable model. It was also observed that nuisance parameter produces an important role in these four tests. Hence in the end it was determined that the correlation among the independent variables and residual term in cointegrating equation play a very important role. When the correlation between independent variables and residual term (Endogeneity) is high the JME and t Test of co-integration in a single equation error correction model (TECM) excelled the other tests

2.10. Literature Gap

In the literature throughout the last three periods, different types of co-integration tests have been introduced. These tests are compared on the basis of their size and power characteristics using the Monte Carlo experiment. For example, a comprehensive study was carried out by Haug (1996), In which 9 different test of co-integration including single equation and system based were studied. He concludes in his study that if the regressor are endogenous then tests established by stock and Watson (1988) and PO (1990) perform better as compared to remaining tests in case of power. Whereas if the regressor are weakly endogenous than another tests are better performs. They give a mixed result. The comparison was carried out on the basis of Monte Carlo simulation and the

design of Monte Carlo support the assumption of model. In the literature Comparison of co-integration tests exist only. But there is no study which compare co-integration test with co-breaking on real data. So, there was a gap in the literature that tests can compare on the basis of size and power using real economic data. Comparison of co-integration tests with co-breaking does not exist. To fill this gap this study was carried in which we considered three econometrics techniques, i.e. Co-integration, co-breaking and Modified R using real data of consumption and income of 44 countries.

Chapter: 3

METHODOLOGY AND DATA

In this chapter, we will discuss the techniques used for comparison and basis of comparison which include calculation of size and power. The data description is available at the end of this chapter.

3.1. Comparison Methodologies

In this chapter we explain the methodologies that will comfort to achieve the objective of the study. Sections are dedicated to each econometric methodology used in our study. Sub section 3.2.1 discusses the Engle and Granger co-integration test, sub-section 3.2.2 explains the JJ co-integration test whereas, section 3.3 enlightens the co-breaking methodology. Lastly, in section 3.4 we discussed the Modified R.

3.1.1. Co-integration test

The vital development in the econometrics literature is the idea of co-integration, two variables will be cointegrated if they have a long-term relationship or equilibrium relationship between them. The formal definition of co-integration is,

"The component of vector Y_t are said to be cointegrated of order d, b, denoted Y_t ~ CI (d, b),

If (i) Y_t is I (d) and (ii) there a non-zero vector α such that $\alpha' Y_t$ ~ I (d-b), d>b>0. The vector 'α' is called the co-integration vector". (Engle and Granger, 1987).

The cointegrated series are CI (d, b), where d is the common order of integration of the variables included in the analysis and 'b' is the order of co-integration that is the reduction relative to 'd' in the order of integration of the linear combination of the variables.

Two most popular classes of co-integration tests, one is single equation (Residual based) tests and the other is based on System of equations. In this study we are taking one from each. Engle Granger from the residual based and JJ Methodology from the System based tests.

3.1.1.1. Engle and Granger

The popular method to estimate the co-integration relationship is the Engle and Granger (1987) two step procedure. The co-integrating test by Engle and Granger methodology recommends a straightforward test whether the variables are cointegrated and we have X_t and Y_t series in vector Z_t.The first step is to check the stationarity of the time series variable. If both the series are integrated of order I (1) then we perform the following regression.

$$Y_t = \alpha + \beta X_t + \mu_t \quad \ldots (3.1)$$

Y_t is dependent variable,X_t is explanatory and μ_t is the residual term.

Next step is the test of the null hypothesis of no co-integration. Engle and Granger's preferred test is the Augmented Dickey fuller (ADF) test for Co-integration. This is applied on the residual obtained from the co-integration regression. This is to estimate the following ADF regression.

$$\Delta\mu_t = \emptyset\mu_{t-1} + b_1\Delta\mu_{t-1} + \cdots + b_p\Delta\mu_{t-p} + \varepsilon_t \quad \ldots (3.2)$$

Where μ_t is the residual from equation 3.1. The hypothesis that $\emptyset = 0$ is tested using the critical t-value. Rejection of null hypothesis of no co-integration implies that the variables are cointegrated that is they have the long–run equilibrium relationship. In the presence of co-integration relationship, the above estimated regression gives the long-run estimates of the model. Moreover, in this test it is assumed that there is only one co-integration relationship between variables. The equilibrium relationship between C_t and Y_t implies that if there is any linear combination $\mu_t = C_t - \beta Y_t$ is I (0) then, there is co-integration exist. This μ_t can be tested for unit root by any suitable unit root test, e.g., DF test or PP test.

3.1.1.2. Johansen co-integration

The Johansen (1988) and Johansen and Juselius (1990) maximum likelihood methods is one of the vital and mostly used methodology for co-integration analysis to deal with econometrics modeling of non-stationary series. Johansen (1988) proposed the maximum likelihood procedure to estimate the cointegrated vectors.

The dynamic model of co-integration is represented through ECM. The long run relationship between co-integration and error correction mechanism (ECM) is proved in the Granger representation theorem (Engle and Granger, 1987). The VAR is presented as;

$$X_t = \mu_t + A_1X_{t-1} + A_2X_{t-2} + A_3X_{t-3} + \cdots + A_kX_{t-k} + \Phi D_t + \varepsilon_t \quad \ldots (3.3)$$

Where X_t is vector of variables include in the model. The above equation can be written as,

$$\Delta X_t = \mu_t + \Pi X_{t-1} + \Gamma_1\Delta X_{t-1} + \Gamma_2\Delta X_{t-2} + \cdots + \Gamma_{k-1}\Delta X_{t-(k-1)} + \Phi D_t + \varepsilon_t \quad \ldots (3.4)$$

Where

$$\Pi = \sum_{i=1}^{k} \alpha_i - I$$

and

$$\Gamma_j = \sum_{j=1}^{k-1} \alpha_j$$

There must be at least one non-zero row must exist in Π for the existence of co-integration.

i.e. $0 < rank(\Pi) < k$. JJ (1990) maximum likelihood method of co-integration are used the trace and maximum eigenvalues test for the measurement of the rank Π matrix. The null hypothesis is that there exist "r" or less co-integration vector(s).

Null hypothesis $H_0(r): rank(\Pi) \leq r$

Alternative Hypothesis $H_1(r): rank(\Pi) > r$

The test statistics is used to check the existence for co-integration is as:

Trace Test:

$$\lambda_{trace} = -\mathrm{T} \sum_{i=r+1}^{n} \ln(1 - \widehat{\lambda_i})$$

$\widehat{\lambda_i}$ is the eigenvalues of Π matrix arranged in decreasing order show that $\widehat{\lambda_1} > \widehat{\lambda_2} > \cdots > \widehat{\lambda_k}$. The null and alternative hypothesis of maximum eigenvalue is, null hypothesis H0(r): Rank (Π) = r, the alternative hypothesis is H1 (r+1): Rank (Π) = r+1. The maximum eigenvalue test statistic is Maximum Eigen value Test:

$$\lambda_{max} = -T \times \ln\,(1 - \widehat{\lambda_{r+1}})$$

If null is rejected, then we conclude that co-integration exists. Gonzalo (1990) compare the performance of the different methods through Monte Carlo study. His study includes a simple OLS regression, non-linear least squares, Full information maximum likelihood procedure, principal component method and the method of canonical correlation. He concluded that Johansen (1988) maximum likelihood method is superior to other method. Engle and Granger (1991) also conclude that Johansen (1988) maximum likelihood method better than single equation method.

3.1.2. Co-breaking

Co-breaking is the elimination of deterministic breaks across linear combination of variables. According to this concept the regression models may be used, first to determine whether a given vector of random variables is subject to location shifts and secondly to examine whether the shifts disappear in a linear combination of the variables. These models are hereafter stated as co-breaking regressions. Notably, Co-breaking regressions allow one to investigate whether location shifts in every variable remain exist in a given number of linear combinations.

To formulize the co-breaking regression method, consider a variant of distribution of

$$x_t \,|X_{t-1}^1$$

$$x_t|F_t \sim \text{ID}\{\omega_t, \sum\ \}$$

Where F_t is a general conditioning information set that may comprise for instance, $X^1{}_{t\text{-}1}$ or the σ - field produced by a set of exogenous variables ω_t.

A linear regression model for X_t may now be expressed as

$$x_t = \pi_0 + \kappa d_t + \delta w_t + \varepsilon_t \quad \ldots (3.5)$$

Where $\omega_t \epsilon F_t$ and $\varepsilon_t|F_t \sim \text{ID}\{0, \sum\ \}$

κ may be decomposed into the product $\kappa = \xi\eta'$

There exists a vector $\xi_\perp$ such that $\xi'_\perp\xi = 0$ .Thus the shifts will no longer be present in the linear combination $\xi'_\perp x_t = \xi'_\perp x_0 + \xi'_\perp w_t + \xi'_\perp \varepsilon_t$. The co-breaking regression will be free of structural breaks.

$$y_t = \xi'_\perp z_t + \widetilde{\pi o} + \delta\widetilde{w_t} + \widetilde{\varepsilon t} \quad \ldots (3.6)$$

In the 2nd equation, x_t has been separated into scalar component y_t and an (n-1) dimensional vector z_t, whereas the corresponding components of $\xi_\perp$ are $(\xi_{\perp,0}: -\xi'_{\perp,1})'$ and $\xi_{\perp,0}$ has been normalized to unity; the remaining quantities are defined as, for instance, $\widetilde{\pi o} = \xi'_\perp x_0$.

In practice, the co-breaking regression technique may be applied in two steps:

(1) Test whether the 'k' shifts d_t are in fact exist in every one of the 'n' components of x_t , that is, evaluate a regression model such as (3.5) and test for the significance of κ.

(2) augment the conditional model of $y_t$on z_t in (3.6) by 'd_t' and test whether the shifts are now insignificant.

3.1.3. Modified R

The correlation coefficient is based on the IID properties of the data sets when there is violation of the property the distribution of correlation coefficient drastically changes and give

spurious correlation. To overcome this issue Rehman and Malik (2014) proposed Modified R to be used as a measure of association between two-time series. Which is robust to type and strength of autocorrelation, type of stationarity and type of deterministic part in the DGP of the two series. This statistic is the correlation between recursive forecast errors of autoregressive models fitted to both the series. The procedure of the statistics is defined as follow**.**

For two-time series of length 'T', where 'T' is the number of observation.

Suppose that T_1 < T series.

$x = (x_1, x_2 \ldots\ldots, x_T)$ and $y = (y_1, y_2 \ldots\ldots, y_T)$

1. For T1<T, estimate the auto regressive model $\hat{x}_t = \hat{a}_{T1} + \hat{b}_{T1}\, x_{t-1} + \mu_t$ using OLS.
2. Compute $\hat{x}_{T+1} = \hat{a}_{T1} + \hat{b}_{T1}\, x_{T1}$
3. Compute $\mu_{T1+1} = x_{T1+1} - \hat{x}_{T1+1}$
4. Repeat the Process for T1+1, T1+2, T-1 to compute $\mu_{T1+1}, \mu_{T1+2}, \mu_{T1+3} \ldots\ldots \mu_T$
5. Repeat Steps 1-4 for the series for series $y = (y_1, y_2 \ldots\ldots, y_T)$ to compute forecast error $\varepsilon_{T1+1}, \varepsilon_{T1+2}, \varepsilon_{T1+3} \ldots\ldots \varepsilon_T$.
6. Compute the correlation between the forecast residuals from the two series of the Forecast residuals.

The modified R is based on recursive residuals from autoregressive model with generalized form of linear trend thus is capable of producing desired results.

3.2. Basis of comparison

It is very difficult to evaluate any statistical procedure using real data sets as we do not know the real association among them. However, real data on consumption and income have a strong association which provides an opportunity for us to estimate the procedures designed for testing relationship between time series. If we take income and consumption of same country, they should have a strong relationship. Contrary to this, the relation between income and consumption of different countries should not be strong. The comparison of the Co-integration, Co-breaking and Modified R is based on these steps.

To compare the three methodologies such as co-integration, co-breaking and modified we takes static consumption function.

$$C^{a}{}_{t} = \gamma + \delta Y^{b}{}_{t} + \varepsilon_{t}$$

Where $C^{a}{}_{t}$ indicate consumption of country 'a' and $Y^{b}{}_{t}$ is income of country 'b' and 't' is time period. We tested our three methods using consumption of country 'a' and income of country 'b', for total of 'p' countries. For a test with null hypothesis of "no long-run relationship" two possible outcomes are possible, these are

A. Null hypothesis of no long run relationship is rejected and alternative hypothesis of long run relationship is accepted for $a = b$.
B. Null hypothesis of no long run relationship is rejected and alternative hypothesis of long run relationship is accepted for $a \neq$b.

When outcome "A" has existed then it is true, as the income and consumption of same country should show strong relationship is our basis of real data analysis. However, if outcome "B" has appeared, then it means that we found spurious relationship as income and consumption of two different countries may not be cointegrated.

The empirical power of the test is the percentage of existence of "A" outcomes for "p" countries. But when the "B" outcomes shows up, then it indicates spurious co-integration (long-run relationship) as co-integration may not exist between income and consumption of two different countries. The percentage of the existence of "B" outcome from p(p-1) will be considered as empirical size of the test.

3.3. Data Source

In order to analyze the comparison of three tests to distinguish the genuine and spurious relationship between Income and consumption during 1970 to 2015 we considered 44 countries which are extracted from the data bank of WDI. The targeted variables are consumption and GDP (Current US $).

Chapter: 4

RESULTS AND DISCUSSION

In this chapter we discuss the empirical results of the three econometrics technique which are described in the previous chapter. these three methods help to differentiate genuine and spurious relationship taking consumption and income series. In section 4.1 results of Co-integration tests are discussed. Section 4.2 explained the results of co-breaking technique. The results of MR are discussed in Section 4.3. and in the last conclusion from comparison of three techniques on the basis of their empirical size and power.

If we directly run the regression among the non-stationary series, then the regression is likely to be spurious. There are three strategies to avoid the problem; **1).** Co-integration analysis, co-integration exists if linear combination of the two I (1) series is stationary. **2).** Co-breaking; this method does not need unit root testing. **3)**. Modified R; this also does not need unit root testing.

All three methods help to differentiate genuine and spurious relationship. In this study we will discuss the results and performance of the three tests.

4.1.1. Engle and Granger test for co-integration

This test involves following.

1) Ensure that the series are I (1) and run the static equation.

$$C_t = \propto + \gamma Y_t + \varepsilon_t \qquad \ldots (4.1)$$

Where C_t denotes consumption and Y_t is Income.

2) Test the residual of 4.1 for unit root, if residual are I (0) then co-integration exist.

If we regress consumption on income of the same country the regression should be valid and there should be genuine relationship between two variables. But if one regress consumption of a country

on the income of another country, the results will be not valid and interpretable because of spurious regression. Thus, there is a clear discrimination of genuine relationship and this is to be utilized for performance of three strategies.

We first apply EG procedure to check whether this approach is able to detect the probability of spurious regression. We have 44 different countries in our study and all 44 countries are analyzed, their results are given in the appendix 6. For understanding, three of these countries such as Pakistan, Sri lanka and India, are picked and the results are summarized as follow.

In case of Pakistan we will run 44 regressions, in which consumption of Pakistan is treated as fixed (dependent variable) while income of other countries will be varied. The same procedure is applied for all 44 countries and estimated results are given in Appendix Table 6.1to 6.4.

In the first step we perform the unit root test for both series of all countries and find that these are integrated of order one as under.

Table 4. 1 Order of integration

	Consumption	**Income**
Pakistan	I (1)	I (1)
Sri lanka	I (1)	I (1)
India	I (1)	I (1)

From the above table the results show that C_t and Y_t series of all three South Asian countries are integrated of order 1, we run the above equation 4.1 model for three different countries. It means that for all three countries we have estimated 9 regressions, 3 for each country. Results in the table 4.1 indicate that consumption and income for three countries are all unit roots. Therefore, co-

integration can be applied. In the given table 4.2 We have estimated the ADF value for all 9 residuals which can be further explained as under.

Table 4. 2 Results of EG test for co-integration

Dependent / Independent	(Pak. Cons)	(Sri. Cons)	(Ind. Cons)
(Pak. Inc)	**-1.51279** **(0.36)**	-2.18918 (0.31)	-3.24898 (0.14)
(Sri. Inc)	-2.41087 (0.21)	**-2.49901** **(0.051)**	-2.17964 (0.06)
(Ind. Inc)	-3.85555 (0.006)	-2.00557 (0.28)	**-1.80531** **(0.09)**

*Critical value of EG co-integration at 5% is -3.46.

The above table shows us the results about existence of co-integration in which the diagonal ADF values are the output of same country analysis, while the off-diagonal ADF values are cross countries analysis. Whereas the values in bracket is 'P' value. The null hypothesis of unit root in case of diagonal values are accepted to be less than 5% but in reality, none of the values is less than 5% and we conclude that there exists no co-integration. On the other hand, null hypothesis of unit root in case of off-diagonal values are accepted at 5% level of significance except regression of Pakistan consumption on India income, which show us co-integration between both cross-country series. The diagonal represent power and is define as the probability of rejecting the Null hypothesis i.e. no co-integration is false when we have income and consumption of different countries. But we did not get any rejection in diagonal, therefore power is zero.

Similarly, for the remaining countries the same process is carried out and the results are given in Appendix table 6.1 to 6.4. In which for cross countries examination 149 out 1892 show the long run relation obviously there is no long run relationship for cross countries and this significance

indicate probability of spurious regression under the null hypothesis of no long run relationship. This can also be regarded as size, define as probability of rejection of H_0 when it is true i.e. H_0; no co-integration. When we have consumption and income of different countries, the probability of rejection in this case may be regarded as size. In our cross countries analysis 149 out of 1892 shows spurious regression. So, we conclude that the size of EG test is 7.88%. Whereas null hypothesis H_0 of no co-integration is false and alternative hypothesis of co-integration (exists) is true when we have consumption and income of same countries. The probability of accepting H_1 in this case may be regarded as Power. We investigate the power of EG test in the same country analysis and found it 20.45%. which shows that only 9 out of 44 countries shows strong relationship between consumption and income.

4.1.2. Johansen and Juselius Co-integration

To apply Johansen and Juselius test for co-integration, at least two variables must be integrated of order one. Therefore, in first step we checked the stationarity of series. After that we apply Johansen co-integration test to investigate the long-run relationship between both series. We will apply JJ test to check the genuine and spurious relation among consumption and income of different countries. For understanding we will take results of only three countries here, while the remaining results are putted in Appendix Table 6.5 to 6.8. The null hypothesis of JJ Co-integration test is, there is no co-integration while alternative is that there is co-integration.

$$H_o: \quad H\ (r=0)$$

$$H_1: \quad r>=1$$

The results estimated through JJ test are given as under.

Table 4. 3 Results of JJ Test for Co-integration

Dependent / Independent	(Pak.Cons)	(Sri.Cons)	(Ind.Cons)
(Pak.Inc)	**0.930062**	0.819627	0.189346
(Sri.Inc)	0.757299	**0.099123**	0.636653
(Ind.Inc)	0.019668	0.579712	**0.664675**

*P value of at 5%

In the above table results of 'P' value at 5% level of significance for same country analysis are in the diagonals entries while the cross countries are in the off diagonals. The null hypothesis of no co-integration in case of diagonal values are accepted at 5% level of significance and we conclude that there exists no co-integration. On the other hand, null hypothesis in case of off-diagonal values are accepted at 5% level of significance except regression of Pakistan's consumption on India's income, which show us co-integration between both cross-country series.

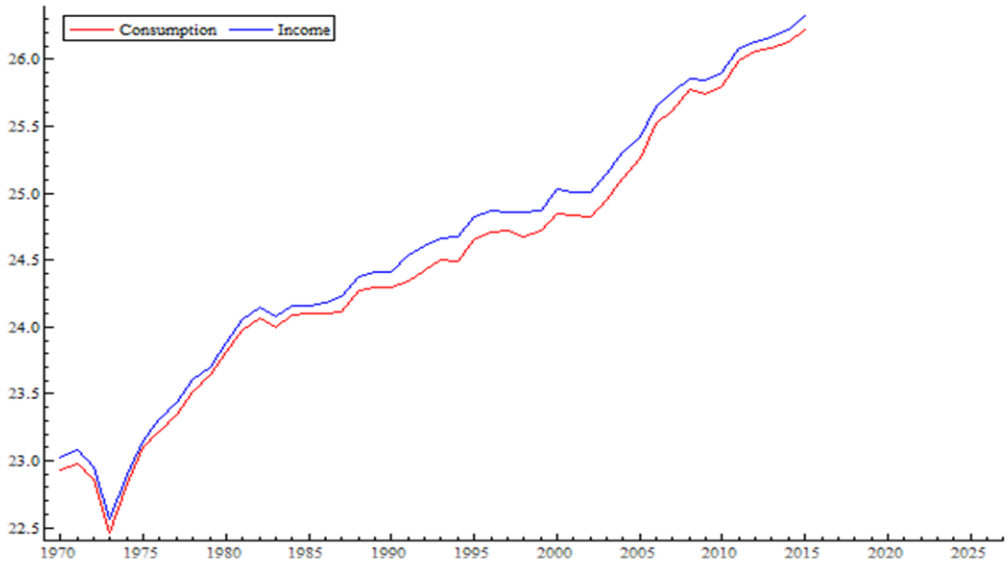
Similarly, for the remaining countries the same process is carried out and the results are given in Appendix table 6.5 to 6.8 in which for the cross countries analysis 339 out of 1892 shows spurious long run relationship, as there is no long run relationship for cross countries and this significance indicate probability of spurious regression. The probability of rejection in this case when our null hypothesis of H_0 is true may be regarded as size. In our analysis of consumption and income of 44 countries we have calculated that there are 17.92% empirical size distortion in JJ co-integration test. The alternative hypothesis of H_1; co-integration exists is true when we have income and consumption of same country. The probability of rejection of H_0 is regarded as power. As the diagonals entries show that 20 out of 44 countries have genuine relationship and the empirical power calculated for JJ is recorded as 45.45%.

4.2. Co-breaking

The co-breaking regression technique is applied in two steps. Firstly, test whether a given vector of variables is subject to location shift. Secondly, examine whether the shifts vanish in a linear combination of variables.

4.2.1. Step 1. Detection of location shift

Graphical representation of Consumption and income of Pakistan



In 1st step we detect location shift separately for each series through dummy saturated method in ox Metrics software. It detects and automatically generate dummies for the breaks in the individual series. As we are taking three South Asian countries, it generates 6,11 and 12 dummies for the common breaks in the consumption and income of Pakistan, Sri lanka and India respectively. Ox Metrics software create dummies for these breaks by default. The first condition for co-breaking is that the common dummies should be significant. Our results showed that all common dummies in consumption and income of the selected South Asian countries are highly significant.

4.2.2. Step 2. Detecting whether shift remain in linear combination

In this step we run OLS regression on consumption and income and stored the residuals series for each country. The stored residuals were then regress on common dummies. It is necessary for the second step of co-breaking that the common dummies should be insignificant. The joint testing probability value of all same and cross-country analysis are given in the table.

Table 4. 4 Results of co-breaking test

Dependent / Independent	(Pak.Cons)	(Sri.Cons)	(Ind.Cons)
(Pak.Inc)	**0.825**	0.002	0.000
(Sri. Inc)	0.001	**0.007**	0.165
(Ind.Inc)	0.009	0.23	**0.65**

In the above table values on diagonals entries are the output of same country analysis, while the off-diagonal values are cross countries analysis. As for the condition of co-breaking the dummies should be insignificant meaning that the breaks vanish in the linear combination. If this condition fulfils, then such process is called co-breaking. Keeping this condition in mind, above results in the table 4.4 shows that in the diagonals entries for both Pakistan and India show long-run relationship between consumption and income whereas the consumption and income of Sri lanka show no long-run relationship. The off diagonals entries which are the final results of cross-country analysis displays that there is no co-breaking in the cross countries except the regression of India and Sri lanka.

Likewise, for the rest of the countries the same process is carried out and the results are given in Appendix table 6.9 to 6.11. In the analysis for cross countries examination 903 out 1892 show the co-breaking, this significance indicates probability of spurious regression under the null hypothesis

of no co-breaking. This can also be regarded as size, as it is probability of rejection of null hypothesis when H_0 is true, if we have consumption and income of different countries. So, we conclude that the size of CB test is 47.73%. Whereas null hypothesis H_0 of no co-integration is false and alternative hypothesis of co-integration exists is true when we have consumption and income of same countries. The probability of accepting H_1 in this case may be regarded as Power. We investigate the power of Co-breaking test in the same country analysis and found it 54.55%. which shows that 24 out of 44 countries shows strong relationship between consumption and income.

4.3. Modified R

Conventional measure of correlation between two time series gives us invalid measure of association, so a new statistics named MR is introduced to measure the correlation between time series which is reliable and a valid measure of association. In the previous chapter we have fully discussed MR test step wise. In this chapter, we will discuss the results of association among different countries derived through MR given in Appendix 6.12 to 6.15. All 44 countries are analyzed and the results are given in appendix. But for understanding three of these countries are picked and results are summarized as follow.

Table 4. 5 Results of Modified R

Dependent / Independent	(Pak.Cons)	(Sri.Cons)	(Ind.Cons)
(Pak.Inc)	**0.959437**	0.151854	0.108684
(Sri.Inc)	0.143491	**0.948405**	-0.02289
(Ind.Inc)	0.217733	-0.03799	**0.982635**

*Statistical value of MR.

Results in the table 4.5 shows diagonal values which are the output (critical value at 5%) of same country analysis, while the off-diagonal values are cross countries analysis. The critical value for MR test at 5% level of significance is 0.37[1] The null hypothesis of no long-run relationship in case of diagonal values are reject at 5% level of significance and we conclude that there exists genuine relationship. On the other hand, null hypothesis in case of off-diagonal critical values of MR are accepted at 5% level of significance. which show us no spurious relationship between consumption and income in all three cross country series.

In the similar manner, rest of the analysis is carried out among 44 countries and the results are given in Appendix table 6.12 to 6.15. In which for cross countries analysis 376 out of 1892 display spurious regression and empirical size distortion in this case is 19.87%. For same countries analysis all 44 countries consumption and income have genuine long run relationship as their calculated value is more than the critical value of MR at 5% level of significance. Therefore, this leads to 100% power. In the above section we have already discussed the results of three category of tests and also mentioned the performance of these tests on the basis size and power of test. Here we briefly overview the size and power of three tests which are shown in the below chart.

[1] The critical value for MR were calculated in excel.

4.4. Comparison of Size and Power of EG, JJ, CB and MR

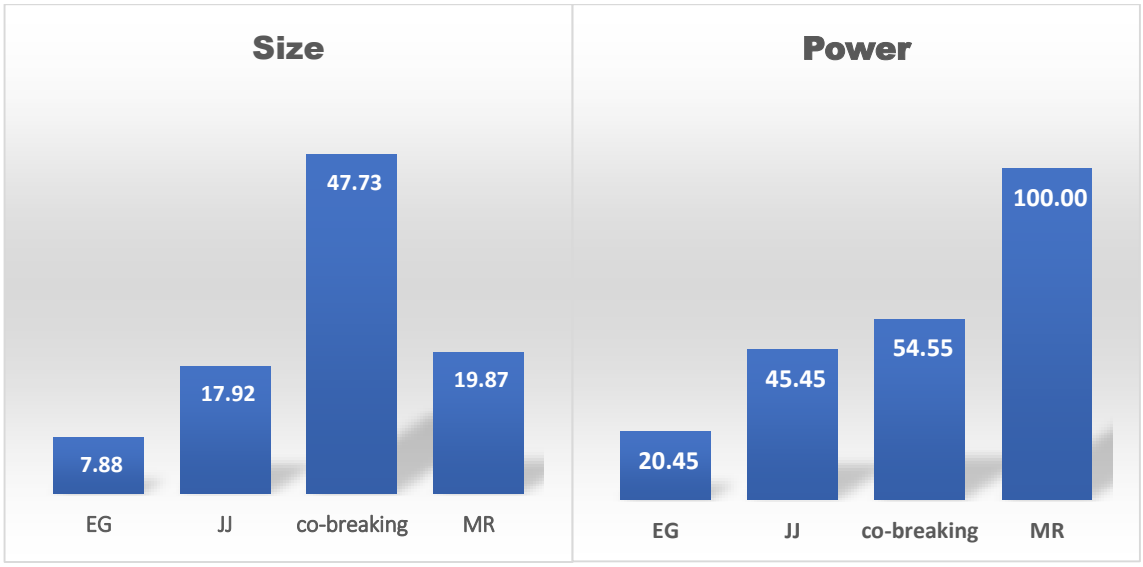


Figure 4.1

From the results of all tests above figure portrays the empirical power and size distortion. The EG co-integration test has a smallest size distortion but it has very lowest power as compare to rest of the tests. We can interpret our results in three different case. **1)**if our focus is to minimize the size distortion of the tests, then in this case EG size is 7.88% is the best one among others. **2).** From the figure 4.1 we can see that size distortion of JJ and Modified R are approximately equal So we can compare the two tests as their size are comparable. If we compare these two tests MR show better performance as their Power is greater than JJ. **3**). All the tests are comparable on the basis of their operational power. Operational power can be calculated as Power minus Size. The operational power of the co-integration, co-breaking and MR are given in below Table.

Table 4. 6 Operational Power of EG, JJ, Co-breaking(CB) and MR

Methodology	Size	Power	Operational Power
EG	7.88	20.45	12.57
JJ	17.92	45.45	27.53
CB	47.83	54.55	6.82
MR	19.87	100.00	80.13

Now from the above table we conclude that on the basis of operational power we can say that MR is best among all three which show better performance in our analysis as compared to remaining tests.

Chapter: 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In this chapter firstly, summary of the study is explained after that conclusion drawn from our study are explained and recommendations are proposed.

5.1. Summary

Tests of co-integration, co-breaking and Modified R were compared on the basis of real data. As it is strongly endorsed by economic theory that consumption and income of a same country are cointegrated and consumption and income of two different countries are not cointegrated, so on basis of this theory co-integration, co-breaking and Modified R tests were compared on basis of empirical size and empirical power by taking data of consumption and income of 44 countries. We have taken three categories of tests in our study, In the first category of co-integration we used two most common co-integration tests in our studies. i.e. EG and JJ co-integration. In the EG co-integration tests, the analysis was carried out for 44 countries using the income and consumption data. In which for cross countries analysis 149 out of 1892 shows long-run relationship practically they are independent from each other. This significant shows the probability of spurious regression having null hypothesis of no long run relationship. This is regarded as size of the test, as it is the probability of rejecting the Null hypothesis when it is true. So, we concluded that size of EG is 7.88%. Whereas in case of same country analysis, the alternative hypothesis of long-run relationship is true. The probability in this case is regarded as Power of the test. From the analysis we concluded that power of EG in this case is 20.45%. The same procedure is carried out for all the tests, the size distortion of JJ is 17.92% in which 339 out 1892 shows spurious relationship Whereas the power calculated of the same country case, only 20 out of 44 shows genuine relationship and the power calculated is 45.45%. likewise, we applied Co-breaking on the

consumption and income of the data set, in which we concluded that in the cross countries analysis 903 out 1892 shows Spurious co-breaking and the size distortion recoded for this analysis is 47.73%. We investigate the Power of the tests in the same country analysis and found that the power of co-breaking test is 54.55% showing that 24 out 44 are genuine relationship. In the last the MR procedure is carried out for 44 countries to differentiate between the genuine and Spurious relationship. In cross countries analysis 376 out of 1892 regressions shows Spurious relationship and empirical size in this case is 19.87%. Whereas in same countries analysis all 44 countries consumption and income have genuine long run relationship.

5.2. Conclusions

Based on the analysis, we concluded that EG co-integration test has a smallest size distortion but it has very low power as compare to rest of the tests. We can finally interpret our results in three different case. Firstly, the size distortion of EG is noted as 7.88% which is best among others in the case when our objective is to minimize the size distortion of the tests. Secondly, the Size distortion (figure 4.1) of JJ and MR are approximately equal so, we can compare these two tests as their size are comparable. When we compared these two tests MR show better performance as their Power is greater than JJ. Thirdly, we calculated the operational power for each test and the operational power of EG, JJ, Co-breaking, MR are 12.57, 27.53, 6.82 and 80.13% respectively. On the basis of operational power, we conclude that MR is best tests Which show better performance in our analysis as compare to remaining tests. The tests are not directly comparable as size does not match. If we look at the size distortion of all tests, then in this case MR and JJ has similar size distortion. So, we can conclude that MR and JJ is comparable. Among these MR showed better perform as their power is very high

5.3. Recommendations

As it was concluded that when we used the EG, JJ, CB and MR tests to distinguish the genuine and spurious relationship between income and consumption of 44 countries among all the tests MR perform better in our study. So it is recommended for the practitioners that MR should be used as best tests as it has a high power to distinguish between genuine and Spurious relationships among variables. Our study was restricted as it was comparing MR with only residual based and equation-based tests, other alternative test of co-integration like ARDL can also compared

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6. APPENDIX

Table 6.1. Results of Engle and Granger Co-integration

Cons / Income	Alge.	Argen.	Brazil	China	Cuba	Colm.	Costa	Domin.	Ecudr	Guyana	Jamaica
Algeria	**-1.84**	-1.78	-1.76	-1.76	-2.11	-1.81	-1.60	-1.49	-2.24	-1.05	-1.70
Argentina	-2.41	**-3.13**	-3.13	-3.13	-2.47	-2.42	-3.09	-2.17	-2.76	-1.44	-2.33
Brazil	-1.94	-2.87	**-2.68**	-2.68	-2.45	-2.59	-3.70	-2.82	-2.67	-0.72	-2.13
China	-2.60	-2.44	-2.45	**-2.45**	-3.04	-1.86	-2.67	-2.35	-3.44	-1.66	-3.26
Cuba	-2.08	-2.39	-2.19	-2.19	**-2.58**	-2.21	-2.32	-2.12	-4.13	-1.62	-1.87
Colombia	-2.15	-2.53	-3.14	-3.14	-2.50	**-2.51**	-3.50	-3.15	-3.25	-0.68	-2.50
Costa	-2.08	-3.01	-3.87	-3.87	-2.62	-3.34	**-4.56**	-3.04	-3.27	-1.47	-3.45
Dominicn	-2.09	-2.30	-3.10	-3.10	-2.29	-3.32	-2.94	**-3.77**	-2.84	-1.04	-2.88
Ecuador	-1.94	-2.44	-2.23	-2.23	-3.73	-2.66	-2.75	-2.28	**-3.93**	-1.99	-2.35
Guyana	-2.51	-1.99	-1.87	-1.87	-2.45	-1.44	-1.83	-1.72	-2.71	**-4.80**	-1.93
Jamaica	-2.16	-2.52	-2.56	-2.56	-2.02	-2.60	-3.93	-2.96	-2.65	-1.01	**-1.75**
Mexico	-2.04	-2.60	-3.49	-3.49	-2.08	-3.29	-3.45	-3.14	-2.43	-0.95	-3.13
C. African	-2.13	-1.85	-1.53	-1.53	-1.47	-1.55	-1.29	-1.32	-1.56	-0.59	-1.44
Peru	-2.27	-2.45	-2.35	-2.35	-2.54	-2.18	-3.44	-2.42	-2.65	-1.26	-2.77
S. Africa	-2.34	-2.34	-3.28	-3.28	-3.49	-2.68	-3.53	-2.53	-2.97	-0.98	-1.99
Thailand	-2.06	-3.23	-2.80	-2.80	-1.64	-1.85	-3.00	-1.77	-2.04	-0.81	-2.07
Turkey	-1.82	-2.26	-2.79	-2.79	-2.43	-2.97	-3.37	-3.04	-2.83	-1.51	-3.77
Pak	-3.08	-3.03	-4.10	-4.10	-4.98	-3.42	-4.87	-3.18	-4.31	-1.27	-2.74
Sri lanka	-2.51	-2.61	-2.66	-2.66	-3.09	-2.06	-3.35	-2.17	-3.17	-1.47	-2.66
Kenya	-2.08	-2.30	-1.41	-1.41	-3.67	-2.44	-2.73	-2.39	-4.02	-1.95	-2.20
Zimbabwe	-2.47	-2.05	-1.52	-1.52	-2.02	-1.52	-1.87	-1.45	-1.92	-1.18	-1.17
Israel	-1.86	-2.79	-2.59	-2.59	-1.53	-2.33	-3.84	-2.02	-2.31	-0.98	-2.31
Italy	-1.84	-2.25	-1.60	-1.60	-0.96	-2.02	-1.68	-1.51	-1.61	-0.62	-1.66
Indonesia	-2.10	-2.71	-3.03	-3.03	-4.12	-2.80	-3.47	-2.56	-3.63	-1.35	-2.24
Burundi	-2.50	-1.64	-1.16	-1.16	-1.84	-1.18	-1.44	-1.02	-1.82	-1.15	-1.47
Finland	-1.88	-2.58	-1.75	-1.75	-1.27	-2.68	-2.64	-2.13	-1.99	-0.67	-1.63
Gabon	-2.69	-2.32	-2.40	-2.40	-3.53	-2.95	-2.67	-2.24	-2.86	-1.45	-1.96
Morocco	-1.92	-2.70	-3.00	-3.00	-2.21	-2.96	-4.26	-2.84	-2.45	-1.06	-2.31
Mauritani	-2.12	-2.30	-2.53	-2.53	-3.46	-2.37	-3.41	-1.95	-3.27	-1.53	-2.23
Denmark	-1.80	-2.57	-2.29	-2.29	-1.17	-2.61	-2.56	-2.29	-1.97	-0.85	-2.20
Bolivia	-1.87	-2.29	-1.94	-1.94	-2.96	-1.40	-2.17	-1.38	-4.38	-1.77	-1.94
Cameroon	-2.01	-2.16	-2.54	-2.54	-2.47	-1.81	-1.90	-1.73	-2.04	-1.02	-1.89
Congo	-2.61	-1.81	-1.87	-1.87	-3.95	-2.06	-2.37	-1.62	-3.10	-1.16	-1.89
Gambia	-1.70	-1.73	-1.86	-1.86	-1.12	-1.29	-1.55	-0.80	-1.56	-0.48	-2.00
Egypt	-2.41	-2.97	-3.01	-3.01	-3.13	-2.53	-4.09	-2.30	-3.54	-1.08	-2.31
Sierra	-2.43	-2.11	-2.12	-2.12	-2.42	-1.60	-1.91	-1.85	-2.75	-3.02	-1.92
Ghana	-3.12	-2.31	-2.57	-2.57	-3.70	-2.14	-2.44	-2.24	-3.56	-2.19	-2.46
Malawi	-2.23	-2.52	-2.73	-2.73	-4.32	-2.63	-3.09	-2.50	-3.34	-1.63	-2.66
Honduras	-2.10	-2.17	-2.82	-2.82	-3.63	-2.57	-2.51	-2.15	-4.03	-1.49	-2.52
India	-2.36	-2.42	-2.23	-2.23	-3.75	-1.97	-3.19	-2.21	-3.46	-1.43	-2.20
Uruguay	-2.56	-3.01	-3.88	-3.88	-3.03	-2.97	-3.76	-3.15	-3.44	-1.18	-2.51
Guatemala	-1.93	-2.46	-2.91	-2.91	-2.84	-2.98	-2.90	-2.93	-3.61	-1.43	-2.80
Rwanda	-3.28	-2.10	-1.82	-1.82	-3.25	-1.69	-1.75	-1.51	-2.40	-1.33	-1.54
Sudan	-2.09	-2.06	-1.80	-1.80	-2.42	-1.68	-1.88	-1.94	-2.88	-1.80	-1.69

Table 6. 2. Results of Engle and Granger Co-integration

Cons / Incom	Mexico	CAfrican	Peru	S. Africa	Thailand	Turkey	Pak	Sri.L	Kenya	Zimb	Israel
Algeria	-1.70	-2.36	-2.63	-1.98	-1.54	-1.31	-2.40	-1.16	-1.42	-2.43	-1.36
Argentina	-2.72	-2.40	-3.22	-2.46	-3.06	-2.25	-2.60	-2.12	-2.12	-2.54	-2.79
Brazil	-3.18	-2.18	-3.49	-3.07	-2.79	-2.69	-3.22	-1.85	-1.28	-1.87	-2.39
China	-2.30	-2.49	-4.48	-2.13	-2.10	-2.76	-2.00	-2.21	-3.03	-2.65	-2.67
Cuba	-2.13	-2.26	-3.34	-2.56	-1.74	-1.98	-4.12	-2.24	-3.41	-3.07	-1.53
Colombia	-3.26	-2.42	-4.11	-2.66	-2.06	-3.01	-3.65	-1.76	-2.68	-2.27	-2.79
Costa	-3.53	-2.24	-4.00	-3.44	-3.21	-3.38	-3.98	-2.80	-2.89	-2.73	-4.05
Dominican	-3.01	-2.23	-4.43	-2.39	-1.86	-2.87	-2.76	-1.95	-2.75	-2.18	-2.10
Ecuador	-2.03	-1.95	-3.42	-2.22	-1.75	-2.23	-3.77	-2.25	-3.41	-2.54	-1.94
Guyana	-1.69	-2.38	-3.66	-1.77	-1.70	-1.88	-1.49	-1.47	-2.10	-2.78	-1.87
Jamaica	-3.90	-2.33	-4.61	-2.12	-2.43	-3.66	-2.31	-2.31	-2.05	-1.81	-2.76
Mexico	**-2.56**	-2.35	-4.02	-3.02	-3.49	-3.18	-2.54	-1.64	-2.22	-2.05	-3.95
African	-1.74	**-2.50**	-2.22	-2.35	-1.53	-0.85	-1.36	-0.64	-0.43	-2.01	-1.33
Peru	-2.29	-2.24	**-4.96**	-1.87	-1.78	-2.91	-2.17	-2.27	-2.45	-2.15	-2.04
S. Africa	-2.80	-2.81	-3.34	**-2.74**	-3.08	-2.11	-3.81	-1.54	-2.07	-2.01	-2.18
Thailand	-3.46	-2.31	-3.43	-3.19	**-1.23**	-1.97	-2.31	-1.11	-1.55	-2.09	-2.89
Turkey	-2.96	-1.83	-4.01	-2.05	-2.09	**-2.02**	-3.19	-2.62	-2.04	-2.17	-2.41
Pak	-3.30	-2.90	-3.66	-3.99	-3.82	-3.68	**-1.51**	-2.19	-3.35	-2.93	-4.27
Sri lanka	-2.23	-2.45	-4.14	-1.95	-2.01	-2.82	-2.41	**-2.50**	-3.11	-2.57	-2.60
Kenya	-2.30	-1.77	-3.69	-2.04	-1.86	-1.68	-3.49	-2.62	**-2.97**	-2.64	-1.72
Zimbabwe	-1.55	-2.22	-2.23	-1.57	-1.60	-1.50	-1.77	-1.22	-1.48	**-1.48**	-1.36
Israel	-4.02	-2.04	-3.69	-2.26	-2.47	-2.22	-2.94	-1.59	-1.34	-1.84	**-4.81**
Italy	-2.79	-1.87	-2.75	-2.49	-1.81	-0.43	-1.41	-0.49	-0.22	-1.60	-1.55
Indonesia	-2.54	-2.30	-3.57	-3.02	-1.76	-2.67	-4.38	-2.14	-2.90	-2.46	-1.89
Burundi	-1.31	-1.65	-2.28	-1.44	-1.12	-1.18	-1.40	-1.10	-1.16	-3.76	-1.21
Finland	-3.16	-2.13	-2.93	-3.80	-2.68	-1.36	-2.37	-1.03	-0.38	-1.62	-2.01
Gabon	-2.25	-2.45	-2.90	-2.84	-2.26	-2.05	-2.91	-1.65	-2.30	-2.08	-1.84
Morocco	-3.50	-1.87	-3.48	-3.16	-3.12	-2.21	-3.70	-1.74	-1.33	-1.99	-2.32
Mauritania	-2.34	-1.93	-3.55	-1.87	-1.81	-1.87	-3.91	-2.35	-2.63	-2.43	-1.77
Denmark	-4.08	-1.80	-3.25	-3.30	-2.97	-1.42	-2.46	-1.26	-0.77	-1.87	-2.73
Bolivia	-1.55	-1.91	-3.62	-1.65	-1.22	-1.65	-3.00	-1.95	-2.76	-2.94	-1.38
Cameroon	-1.86	-2.84	-2.65	-2.73	-1.98	-1.29	-2.58	-1.22	-1.26	-2.60	-1.49
Congo	-1.95	-2.42	-2.99	-2.12	-1.58	-1.76	-2.67	-1.26	-1.69	-1.90	-1.51
Gambia	-2.09	-1.86	-2.82	-2.00	-1.48	-1.04	-1.07	-0.56	-0.60	-1.76	-1.45
Egypt	-2.69	-2.42	-3.78	-3.23	-2.86	-2.91	-3.12	-1.91	-2.76	-2.77	-3.05
Sierra	-1.75	-2.47	-3.53	-1.77	-1.63	-2.02	-1.89	-1.90	-2.32	-2.77	-1.71
Ghana	-2.20	-2.81	-3.27	-2.28	-2.30	-2.26	-2.20	-2.13	-2.71	-3.23	-2.45
Malawi	-2.39	-1.81	-3.47	-2.63	-2.16	-2.10	-3.62	-2.28	-2.43	-2.56	-2.20
Honduras	-2.34	-2.16	-3.48	-2.67	-2.12	-2.57	-3.66	-1.95	-3.11	-2.66	-2.17
India	-2.33	-2.25	-3.78	-1.71	-1.72	-2.18	-3.86	-2.01	-3.38	-2.63	-1.86
Uruguay	-2.68	-2.46	-4.16	-2.78	-3.34	-2.82	-2.68	-2.46	-2.36	-2.51	-2.97
Guatemala	-2.43	-2.11	-4.14	-2.25	-1.63	-2.47	-3.51	-2.10	-3.15	-2.58	-2.07
Rwanda	-1.57	-1.96	-2.65	-2.00	-1.66	-1.32	-1.99	-1.40	-1.29	-3.09	-1.47
Sudan	-1.95	-2.05	-3.05	-1.87	-1.60	-1.96	-2.17	-1.83	-2.49	-3.23	-1.59

Table 6.3. Results of Engle and Granger Co-integration

Cons / Income	Italy	Indon.	Buru.	Finland	Gabon	Moroc	Maurit	Denm	Boli.	Camer	Congo
Algeria	-1.41	-1.77	-1.69	-1.69	-1.98	-1.56	-1.96	-1.57	-1.40	-2.11	-2.05
Argentina	-2.30	-2.72	-1.67	-2.82	-2.82	-2.78	-2.80	-2.78	-2.36	-2.52	-1.85
Brazil	-1.69	-2.72	-1.09	-1.95	-2.41	-3.29	-3.92	-2.46	-1.90	-2.85	-1.29
China	-1.53	-2.99	-2.02	-2.16	-3.05	-2.61	-4.12	-2.20	-2.54	-2.42	-2.17
Cuba	-1.28	-3.44	-2.06	-1.63	-2.52	-2.21	-4.72	-1.61	-2.90	-3.00	-3.47
Colombia	-2.13	-3.53	-1.35	-2.88	-2.74	-3.47	-4.33	-2.82	-1.77	-2.43	-1.70
Costa	-1.81	-3.62	-1.75	-2.89	-2.64	-4.23	-4.33	-2.69	-2.27	-2.39	-2.03
Dominican	-1.74	-3.05	-1.28	-2.33	-2.42	-2.99	-3.48	-2.54	-1.40	-2.21	-1.73
Ecuador	-1.40	-3.40	-1.56	-1.78	-1.85	-2.23	-3.91	-1.71	-3.44	-2.14	-2.31
Guyana	-1.62	-2.31	-2.05	-1.94	-2.75	-1.97	-3.19	-1.89	-2.33	-2.14	-2.24
Jamaica	-2.07	-2.44	-1.57	-2.23	-2.43	-2.75	-3.16	-2.71	-1.78	-2.35	-1.72
Mexico	-2.86	-2.55	-1.07	-3.35	-2.53	-3.79	-3.31	-4.20	-1.30	-2.12	-1.73
C African	-1.58	-1.47	-0.96	-1.83	-2.39	-0.99	-1.48	-1.42	-0.88	-2.14	-0.42
Peru	-1.36	-2.58	-1.54	-1.90	-2.67	-2.38	-3.65	-2.12	-2.08	-2.15	-1.76
S. Africa	-2.18	-3.01	-1.52	-3.67	-3.41	-3.14	-3.78	-3.16	-2.09	-3.55	-1.86
Thailand	-2.24	-1.47	-1.16	-3.15	-2.56	-2.64	-2.73	-3.37	-1.15	-2.53	-1.39
Turkey	-0.85	-2.93	-1.23	-1.64	-2.32	-2.44	-3.71	-1.65	-1.68	-1.80	-1.56
Pak	-2.25	-4.48	-2.12	-3.60	-3.98	-4.85	-5.96	-3.66	-3.19	-3.65	-2.23
Sri lanka	-1.47	-2.94	-1.93	-2.13	-2.99	-2.67	-4.11	-2.26	-2.46	-2.40	-2.09
Kenya	-0.79	-3.34	-1.74	-1.13	-2.19	-1.63	-3.58	-1.19	-2.75	-1.96	-1.89
Zimbabwe	-1.53	-1.72	-2.48	-1.63	-2.18	-1.69	-1.89	-1.74	-1.98	-2.20	-1.92
Israel	-1.45	-1.93	-1.09	-2.24	-2.18	-2.33	-2.33	-2.52	-1.18	-1.94	-1.30
Italy	**-3.19**	-1.45	-0.58	-2.71	-1.86	-0.91	-1.18	-2.39	-0.73	-1.16	-0.38
Indonesia	-1.74	**-2.54**	-1.63	-2.27	-2.57	-3.39	-5.05	-2.38	-2.59	-2.99	-2.21
Burundi	-0.93	-1.51	**-2.39**	-1.24	-1.79	-1.17	-1.89	-1.28	-1.37	-1.75	-1.94
Finland	-3.70	-1.81	-0.90	**-2.76**	-1.98	-1.84	-1.78	-3.86	-1.17	-2.51	-0.54
Gabon	-2.19	-2.59	-1.74	-2.24	**-2.42**	-2.75	-2.72	-2.63	-2.12	-2.93	-1.94
Morocco	-0.50	-2.83	-1.08	-1.85	-2.33	**-2.57**	-3.17	-1.67	-1.49	-1.87	-1.13
Mauritania	-0.78	-3.54	-1.45	-1.58	-2.43	-2.06	**-4.04**	-1.48	-2.17	-2.18	-1.93
Denmark	-2.31	-1.95	-0.97	-3.27	-1.90	-0.97	-1.90	**-2.62**	-1.22	-1.64	-0.81
Bolivia	-1.11	-2.75	-1.72	-1.53	-2.00	-1.75	-3.44	-1.54	**-1.88**	-2.09	-2.27
Cameroon	-1.11	-2.17	-1.68	-2.31	-3.72	-1.49	-2.42	-1.47	-1.45	**-3.04**	-1.50
Congo	-1.53	-2.35	-1.38	-1.95	-2.69	-2.02	-2.58	-2.24	-1.60	-2.60	**-2.02**
Gambia	-2.03	-1.28	-0.52	-2.21	-1.85	-1.27	-1.32	-2.16	-0.09	-1.63	-1.22
Egypt	-1.86	-3.23	-1.82	-2.74	-2.99	-3.18	-4.17	-2.83	-2.50	-2.59	-2.00
Sierra	-1.62	-2.37	-2.32	-1.92	-2.56	-1.99	-2.92	-1.89	-2.28	-2.18	-3.00
Ghana	-1.70	-3.47	-2.51	-2.39	-3.65	-2.62	-4.48	-2.32	-2.86	-2.79	-3.64
Malawi	-0.40	-3.87	-1.59	-1.63	-2.78	-1.92	-5.12	-1.39	-2.28	-2.02	-1.75
Honduras	-1.40	-2.95	-1.62	-2.31	-2.63	-2.48	-4.03	-2.05	-2.24	-2.26	-2.11
India	-0.96	-3.22	-1.75	-1.77	-2.87	-2.33	-4.43	-1.80	-2.43	-2.36	-2.26
Uruguay	-2.20	-3.33	-1.78	-2.97	-3.24	-3.11	-3.89	-3.08	-2.83	-2.49	-1.98
Guatemala	-1.41	-3.40	-1.53	-2.10	-2.32	-2.75	-4.14	-2.08	-1.56	-2.20	-2.04
Rwanda	-1.04	-2.33	-3.44	-1.53	-2.60	-1.60	-2.26	-1.53	-1.74	-2.29	-2.30
Sudan	-1.16	-2.33	-2.13	-1.35	-2.38	-1.64	-3.56	-1.30	-2.58	-2.20	-4.84

Table 6.4. Results of Engle and Granger Co-integration

Cons / Incom	Gamb.	Egy	Sierra	Ghana	Malv	Hondu	India	Urugy	Guat	Rwan	Sudan
Algeria	-1.46	-1.48	-1.74	-2.00	-1.49	-1.73	-1.35	-2.17	-1.38	-2.73	-1.84
Argentina	-1.97	-2.62	-1.95	-1.84	-2.30	-1.80	-2.02	-3.34	-2.30	-2.28	-1.80
Brazil	-2.24	-2.32	-1.75	-1.86	-2.34	-2.28	-1.50	-3.67	-2.54	-1.84	-1.19
China	-1.87	-1.81	-2.35	-2.16	-2.68	-2.44	-2.14	-2.98	-2.66	-2.37	-2.12
Cuba	-1.52	-2.53	-2.36	-3.45	-4.87	-3.27	-3.25	-2.96	-2.51	-3.27	-2.20
Colombia	-1.79	-2.28	-1.45	-1.90	-2.61	-2.29	-1.55	-3.44	-2.94	-2.01	-1.41
Costa	-1.84	-3.40	-1.96	-2.13	-2.62	-2.20	-2.51	-4.19	-2.85	-2.10	-1.62
Dominican	-1.45	-2.15	-1.71	-1.95	-2.27	-1.91	-1.87	-3.49	-2.84	-1.79	-1.83
Ecuador	-1.48	-2.74	-2.59	-2.86	-3.08	-3.36	-2.93	-3.16	-2.78	-2.24	-2.46
Guyana	-1.70	-1.39	-3.36	-1.98	-2.23	-1.88	-1.68	-1.74	-1.89	-2.21	-2.18
Jamaica	-2.51	-2.21	-1.70	-1.92	-2.48	-2.22	-1.68	-2.89	-2.61	-1.80	-1.33
Mexico	-2.35	-2.18	-1.22	-1.61	-1.72	-1.86	-1.74	-2.78	-2.29	-1.64	-1.59
C African	-1.53	-1.05	-1.33	-0.80	-0.24	-0.97	-0.62	-1.82	-1.11	-1.35	-0.70
Peru	-1.75	-2.40	-2.09	-1.93	-2.15	-2.31	-1.90	-2.97	-2.55	-2.00	-2.19
South Africa	-2.07	-2.82	-1.48	-1.96	-2.49	-2.58	-1.54	-2.85	-2.39	-2.42	-1.74
Thailand	-2.13	-2.17	-1.13	-1.54	-1.49	-1.82	-0.99	-3.75	-1.31	-1.87	-1.18
Turkey	-1.55	-2.48	-2.08	-1.68	-1.53	-2.36	-1.87	-2.86	-2.52	-1.50	-1.68
Pak	-2.11	-3.12	-1.92	-2.03	-3.94	-2.90	-3.25	-3.38	-3.89	-2.73	-2.15
Sri lanka	-1.80	-2.25	-2.26	-2.22	-2.69	-2.15	-2.18	-3.24	-2.44	-2.29	-2.11
Kenya	-1.39	-2.55	-2.69	-2.74	-2.85	-3.07	-3.35	-2.66	-2.73	-1.85	-2.42
Zimbabwe	-1.75	-1.58	-1.67	-1.81	-1.78	-1.62	-1.50	-1.80	-1.62	-2.28	-1.97
Israel	-1.81	-2.03	-1.32	-1.59	-1.37	-1.59	-0.85	-3.37	-1.61	-1.56	-1.24
Italy	-2.10	-1.21	-0.97	-0.52	0.60	-1.04	-0.15	-2.37	-0.98	-0.87	-0.55
Indonesia	-1.63	-2.80	-1.86	-3.01	-3.92	-2.37	-2.68	-3.47	-2.84	-2.59	-2.05
Burundi	-1.23	-1.20	-1.93	-1.66	-1.29	-1.32	-1.10	-1.74	-1.25	-2.46	-1.97
Finland	-2.27	-1.85	-1.13	-1.22	-0.74	-1.62	-0.70	-2.90	-1.65	-1.32	-0.50
Gabon	-1.75	-2.29	-1.91	-2.51	-2.75	-2.50	-2.47	-3.15	-2.31	-2.45	-2.15
Morocco	-1.71	-2.39	-1.53	-1.72	-0.76	-1.93	-1.35	-3.11	-2.24	-1.54	-1.16
Mauritania	-1.42	-2.63	-2.25	-2.92	-2.93	-2.51	-2.62	-3.00	-2.55	-1.99	-2.34
Denmark	-2.14	-2.02	-1.26	-1.17	-0.45	-1.55	-0.85	-3.09	-1.67	-1.41	-0.60
Bolivia	-1.11	-2.17	-2.36	-2.60	-2.57	-2.23	-2.32	-2.79	-1.36	-1.87	-2.74
Cameroon	-1.64	-1.63	-1.56	-1.68	-1.11	-1.46	-1.24	-2.28	-1.49	-2.26	-1.55
Congo	-1.59	-1.70	-1.75	-2.47	-2.11	-2.50	-2.00	-2.13	-1.97	-2.33	-2.91
Gambia	**-3.58**	-0.93	-1.19	-0.61	-0.48	-1.19	-0.64	-1.92	-0.96	-1.14	-1.10
Egypt	-1.85	**-2.04**	-2.06	-2.00	-2.69	-1.88	-2.16	-3.42	-2.89	-2.27	-1.79
Sierra	-1.80	-1.89	**-2.53**	-3.02	-2.52	-2.22	-2.07	-2.15	-1.92	-2.38	-3.40
Ghana	-1.88	-2.07	-3.32	**-2.23**	-3.28	-2.63	-2.56	-2.50	-2.48	-2.84	-3.43
Malawi	-1.52	-2.37	-2.38	-2.46	**-2.56**	-2.38	-2.87	-2.75	-2.75	-2.07	-2.16
Honduras	-1.65	-2.09	-2.18	-2.28	-2.73	**-2.30**	-2.20	-2.84	-3.00	-2.09	-1.93
India	-1.65	-2.38	-2.27	-2.45	-3.31	-2.33	**-1.81**	-2.80	-2.48	-2.22	-1.90
Uruguay	-2.08	-2.81	-1.99	-2.02	-2.49	-2.28	-2.10	**-4.08**	-3.09	-2.30	-2.04
Guatemala	-1.52	-2.69	-2.02	-2.13	-2.63	-2.77	-2.26	-3.56	**-2.85**	-1.89	-2.00
Rwanda	-1.42	-1.55	-2.09	-1.98	-1.96	-1.71	-1.73	-2.02	-1.57	**-2.69**	-3.02
Sudan	-1.72	-1.76	-3.43	-3.59	-2.79	-2.23	-1.97	-2.35	-2.16	-2.62	**-2.53**

Note: The Same country relationship are display in the diagonals with Values in Bold whereas the values in the off diagonals values showing the cross countries relationship. The critical values of Engle and Granger co-integration test at 5% level of significance is -3.46.

Table 6.5 Results of Johansen and Jueselius co-integration test

Cons / Income	Algeria	Argtina	Brazil	China	Cuba	Clmbia	Costa	Domican	Ecudr	Guyna	Jmica
ALG	**0.00**	0.04	0.13	0.03	0.03	0.18	0.24	0.12	0.10	0.06	0.12
ARG	0.09	**0.66**	0.01	0.24	0.20	0.28	0.30	0.17	0.53	0.89	0.56
BRA	0.09	0.02	**0.01**	0.13	0.13	0.15	0.06	0.14	0.51	0.57	0.46
CHN	0.02	0.25	0.09	**0.14**	0.01	0.15	0.19	0.18	0.15	0.59	0.14
CUB	0.01	0.24	0.17	0.02	**0.13**	0.38	0.31	0.28	0.10	0.03	0.07
COL	0.10	0.31	0.14	0.20	0.19	**0.68**	0.30	0.08	0.52	0.66	0.42
CRI	0.28	0.40	0.09	0.26	0.19	0.38	**0.02**	0.35	0.50	0.92	0.40
DOM	0.08	0.26	0.12	0.18	0.27	0.02	0.35	**0.00**	0.38	0.81	0.06
ECU	0.01	0.53	0.57	0.18	0.08	0.65	0.47	0.52	**0.00**	0.29	0.41
GUY	0.03	0.88	0.62	0.65	0.10	0.77	0.93	0.84	0.43	**0.02**	0.83
JAM	0.25	0.56	0.43	0.33	0.14	0.37	0.44	0.06	0.59	0.74	**0.51**
MEX	0.14	0.26	0.13	0.35	0.20	0.11	0.05	0.04	0.30	0.62	0.28
C AFR	0.04	0.03	0.16	0.16	0.02	0.13	0.41	0.22	0.26	0.51	0.38
PER	0.23	0.37	0.40	0.11	0.33	0.35	0.42	0.12	0.51	0.83	0.41
S. AFR	0.08	0.03	0.06	0.27	0.09	0.18	0.31	0.32	0.36	0.65	0.47
THA	0.07	0.01	0.06	0.23	0.06	0.15	0.24	0.20	0.42	0.52	0.43
TUR	0.22	0.14	0.14	0.33	0.06	0.02	0.09	0.01	0.31	0.77	0.30
PAK	0.12	0.47	0.11	0.57	0.00	0.25	0.06	0.22	0.07	0.98	0.62
SRI	0.16	0.49	0.32	0.31	0.08	0.65	0.36	0.56	0.62	0.94	0.63
KEN	0.07	0.58	0.70	0.12	0.09	0.79	0.73	0.79	0.60	0.30	0.52
ZIM	0.01	0.46	0.12	0.17	0.04	0.20	0.51	0.66	0.46	0.07	0.60
ISR	0.16	0.13	0.19	0.26	0.31	0.59	0.16	0.21	0.58	0.77	0.54
ITA	0.07	0.00	0.06	0.15	0.13	0.07	0.35	0.03	0.19	0.29	0.13
INDON	0.04	0.17	0.04	0.15	0.01	0.09	0.17	0.20	0.00	0.58	0.36
BUR	0.08	0.62	0.68	0.43	0.15	0.68	0.95	0.89	0.44	0.07	0.68
FIN	0.06	0.01	0.05	0.04	0.10	0.12	0.12	0.05	0.19	0.23	0.15
GAB	0.01	0.05	0.05	0.01	0.00	0.05	0.07	0.07	0.01	0.05	0.04
MOR	0.13	0.03	0.03	0.14	0.10	0.04	0.03	0.03	0.24	0.47	0.26
MAU	0.07	0.07	0.26	0.23	0.09	0.26	0.36	0.46	0.35	0.73	0.58
DEN	0.08	0.01	0.01	0.11	0.21	0.01	0.12	0.01	0.08	0.17	0.10
BOL	0.06	0.61	0.13	0.17	0.14	0.50	0.61	0.55	0.19	0.03	0.17
CAM	0.04	0.05	0.15	0.11	0.01	0.16	0.17	0.24	0.13	0.31	0.34
CONGO	0.01	0.11	0.36	0.17	0.02	0.55	0.51	0.50	0.20	0.59	0.29
GAM	0.01	0.16	0.27	0.33	0.10	0.23	0.58	0.28	0.62	0.70	0.49
EGY	0.19	0.30	0.02	0.50	0.10	0.00	0.26	0.06	0.20	0.62	0.74
SIE	0.01	0.86	0.64	0.44	0.14	0.75	0.88	0.82	0.20	0.13	0.55
GHA	0.06	0.32	0.39	0.52	0.05	0.71	0.80	0.78	0.55	0.83	0.75
MAL	0.20	0.14	0.16	0.16	0.02	0.12	0.22	0.26	0.28	0.78	0.49
HON	0.02	0.71	0.51	0.21	0.01	0.38	0.67	0.03	0.43	0.39	0.20
IND	0.11	0.20	0.36	0.44	0.01	0.86	0.65	0.63	0.64	0.89	0.72
URU	0.20	0.12	0.04	0.35	0.41	0.46	0.05	0.28	0.65	0.90	0.48
GUA	0.01	0.53	0.21	0.18	0.13	0.35	0.45	0.01	0.44	0.59	0.06
RWA	0.01	0.45	0.28	0.13	0.02	0.24	0.70	0.63	0.10	0.24	0.57
SUD	0.02	0.65	0.55	0.37	0.06	0.88	0.82	0.87	0.75	0.54	0.89

Table 6.6. Results of Johansen and Jueselius co-integration test

Cons / Income	Mexi	C.Afri	Peru	S.Afri	Thai	Turkey	Pak	S.lanka	Kenya	Zimba	Israel
ALG	0.18	0.01	0.06	0.09	0.12	0.21	0.02	0.11	0.12	0.02	0.20
ARG	0.20	0.08	0.12	0.02	0.02	0.06	0.46	0.41	0.64	0.56	0.14
BRA	0.18	0.16	0.07	0.06	0.06	0.11	0.09	0.29	0.58	0.09	0.17
CHN	0.29	0.11	0.02	0.21	0.15	0.24	0.49	0.20	0.03	0.06	0.21
CUB	0.37	0.00	0.12	0.21	0.13	0.24	0.01	0.11	0.14	0.03	0.38
COL	0.18	0.18	0.05	0.23	0.26	0.01	0.07	0.61	0.49	0.20	0.62
CRI	0.04	0.44	0.16	0.37	0.25	0.10	0.10	0.33	0.67	0.60	0.20
DOM	0.08	0.32	0.04	0.39	0.30	0.01	0.18	0.49	0.68	0.77	0.29
ECU	0.47	0.21	0.10	0.48	0.53	0.19	0.03	0.55	0.59	0.42	0.71
GUY	0.75	0.49	0.15	0.69	0.54	0.76	0.96	0.92	0.37	0.06	0.79
JAM	0.14	0.44	0.09	0.50	0.43	0.19	0.68	0.66	0.61	0.75	0.48
MEX	**0.37**	0.08	0.04	0.12	0.12	0.01	0.25	0.57	0.56	0.62	0.05
C AFR	0.07	**0.04**	0.15	0.02	0.02	0.43	0.24	0.45	0.36	0.10	0.12
PER	0.59	0.51	**0.04**	0.54	0.52	0.42	0.65	0.33	0.72	0.73	0.67
S AFR	0.17	0.04	0.13	**0.10**	0.06	0.26	0.01	0.29	0.67	0.37	0.31
THA	0.12	0.02	0.04	0.06	**0.57**	0.17	0.26	0.44	0.68	0.44	0.15
TUR	0.09	0.46	0.11	0.29	0.11	**0.13**	0.01	0.55	0.54	0.39	0.48
PAK	0.24	0.12	0.29	0.04	0.09	0.01	**0.93**	0.82	0.42	0.68	0.19
SRI	0.64	0.46	0.12	0.31	0.45	0.53	0.76	**0.10**	0.51	0.65	0.52
KEN	0.71	0.22	0.25	0.71	0.76	0.77	0.19	0.60	**0.45**	0.12	0.90
ZIM	0.54	0.05	0.46	0.27	0.31	0.28	0.64	0.57	0.23	**0.33**	0.54
ISR	0.03	0.18	0.10	0.25	0.21	0.35	0.49	0.38	0.86	0.64	**0.01**
ITA	0.00	0.08	0.02	0.01	0.03	0.17	0.13	0.14	0.23	0.09	0.06
INDON	0.29	0.15	0.10	0.15	0.39	0.03	0.01	0.34	0.45	0.40	0.44
BUR	0.81	0.48	0.64	0.69	0.72	0.57	0.89	0.90	0.57	0.23	0.89
FIN	0.01	0.03	0.02	0.01	0.02	0.09	0.04	0.09	0.19	0.04	0.07
GAB	0.07	0.01	0.02	0.03	0.03	0.04	0.00	0.01	0.07	0.06	0.10
MOR	0.02	0.22	0.06	0.01	0.01	0.01	0.01	0.25	0.57	0.04	0.11
MAU	0.57	0.37	0.14	0.59	0.36	0.20	0.02	0.32	0.72	0.20	0.73
DEN	0.00	0.09	0.03	0.00	0.00	0.06	0.02	0.16	0.16	0.01	0.01
BOL	0.86	0.39	0.09	0.49	0.56	0.12	0.28	0.52	0.12	0.42	0.74
CAM	0.28	0.01	0.09	0.04	0.10	0.27	0.08	0.33	0.05	0.17	0.22
CONGO	0.51	0.13	0.21	0.24	0.34	0.44	0.09	0.35	0.48	0.10	0.54
GAM	0.18	0.05	0.11	0.13	0.21	0.30	0.65	0.68	0.74	0.56	0.42
EGY	0.64	0.44	0.25	0.17	0.13	0.18	0.02	0.52	0.34	0.76	0.63
SIE	0.76	0.41	0.32	0.63	0.56	0.68	0.75	0.76	0.65	0.13	0.79
GHA	0.80	0.38	0.39	0.51	0.47	0.66	0.85	0.78	0.53	0.13	0.71
MAL	0.29	0.52	0.23	0.09	0.06	0.25	0.01	0.44	0.31	0.06	0.46
HON	0.58	0.12	0.00	0.34	0.55	0.45	0.18	0.78	0.42	0.35	0.81
IND	0.79	0.36	0.33	0.52	0.64	0.70	0.02	0.58	0.42	0.17	0.77
URU	0.52	0.13	0.12	0.25	0.12	0.04	0.60	0.63	0.75	0.47	0.46
GUA	0.53	0.26	0.01	0.56	0.47	0.02	0.05	0.54	0.51	0.68	0.57
RWA	0.59	0.34	0.52	0.33	0.41	0.69	0.55	0.69	0.02	0.25	0.61
SUD	0.80	0.02	0.54	0.58	0.45	0.88	0.52	0.86	0.37	0.03	0.79

Table 6.7 Results of Johansen and Jueselius co-integration test

Cons / Incom	Italy	Indons	Burun	Fin.L	Gabon	Morc.	Maurit.	Denm.	Boliv.	Camer	Congo
ALG	0.08	0.09	0.00	0.05	0.00	0.14	0.06	0.07	0.30	0.00	0.07
ARG	0.00	0.21	0.65	0.00	0.04	0.03	0.10	0.00	0.35	0.09	0.41
BRA	0.05	0.06	0.56	0.05	0.03	0.02	0.02	0.00	0.01	0.11	0.62
CHN	0.07	0.14	0.27	0.03	0.01	0.08	0.01	0.04	0.05	0.11	0.20
CUB	0.10	0.06	0.02	0.04	0.00	0.21	0.00	0.18	0.09	0.00	0.03
COL	0.08	0.01	0.59	0.11	0.06	0.02	0.03	0.01	0.09	0.16	0.74
CRI	0.35	0.18	0.88	0.13	0.11	0.06	0.08	0.14	0.40	0.15	0.82
DOM	0.04	0.10	0.84	0.06	0.12	0.02	0.10	0.01	0.35	0.35	0.81
ECU	0.18	0.01	0.19	0.21	0.09	0.19	0.01	0.08	0.04	0.16	0.59
GUY	0.23	0.69	0.40	0.23	0.11	0.43	0.18	0.14	0.02	0.42	0.31
JAM	0.12	0.48	0.85	0.13	0.09	0.23	0.12	0.08	0.34	0.49	0.84
MEX	0.00	0.18	0.72	0.01	0.03	0.02	0.04	0.00	0.83	0.36	0.77
C.AFR	0.04	0.29	0.49	0.04	0.01	0.21	0.35	0.08	0.36	0.03	0.33
PER	0.07	0.33	0.94	0.12	0.16	0.27	0.05	0.10	0.07	0.53	0.95
S AFR	0.03	0.14	0.50	0.02	0.02	0.03	0.08	0.00	0.19	0.02	0.51
THA	0.01	0.47	0.55	0.00	0.01	0.06	0.12	0.00	0.40	0.04	0.48
TUR	0.20	0.04	0.43	0.12	0.09	0.01	0.03	0.08	0.08	0.30	0.76
PAK	0.09	0.01	0.81	0.02	0.01	0.00	0.00	0.00	0.37	0.06	0.73
SRI	0.12	0.41	0.86	0.10	0.08	0.28	0.05	0.14	0.34	0.41	0.75
KEN	0.19	0.37	0.29	0.18	0.07	0.59	0.03	0.15	0.01	0.03	0.64
ZIM	0.04	0.45	0.18	0.03	0.05	0.01	0.20	0.00	0.52	0.10	0.03
ISR	0.05	0.45	0.81	0.06	0.08	0.17	0.26	0.02	0.65	0.19	0.71
ITA	**0.01**	0.11	0.35	0.10	0.08	0.23	0.09	0.15	0.11	0.10	0.37
INDON	0.06	**0.11**	0.40	0.06	0.02	0.01	0.00	0.02	0.03	0.10	0.45
BUR	0.32	0.44	**0.03**	0.25	0.17	0.37	0.28	0.12	0.81	0.45	0.06
FIN	0.02	0.09	0.19	**0.01**	0.03	0.14	0.03	0.05	0.11	0.02	0.23
GAB	0.03	0.02	0.02	0.03	**0.00**	0.04	0.01	0.01	0.01	0.01	0.06
MOR	0.22	0.04	0.39	0.13	0.08	**0.09**	0.02	0.01	0.03	0.09	0.53
MAU	0.16	0.04	0.52	0.16	0.08	0.41	**0.01**	0.15	0.00	0.30	0.72
DEN	0.15	0.04	0.15	0.07	0.06	0.01	0.02	**0.02**	0.01	0.05	0.25
BOL	0.12	0.05	0.31	0.16	0.10	0.04	0.01	0.02	**0.02**	0.46	0.59
CAM	0.09	0.15	0.15	0.02	0.00	0.14	0.04	0.05	0.42	**0.03**	0.11
CONGO	0.17	0.22	0.03	0.13	0.02	0.26	0.08	0.08	0.31	0.02	**0.20**
GAM	0.00	0.53	0.66	0.00	0.01	0.16	0.25	0.00	0.77	0.14	0.70
EGY	0.28	0.06	0.90	0.19	0.12	0.06	0.04	0.08	0.39	0.39	0.59
SIE	0.24	0.61	0.01	0.21	0.07	0.47	0.19	0.14	0.09	0.38	0.23
GHA	0.10	0.50	0.41	0.07	0.03	0.20	0.05	0.06	0.02	0.21	0.13
MAL	0.33	0.03	0.42	0.21	0.09	0.13	0.02	0.16	0.05	0.14	0.72
HON	0.13	0.20	0.37	0.05	0.02	0.38	0.08	0.17	0.77	0.02	0.62
IND	0.26	0.41	0.45	0.15	0.06	0.45	0.03	0.19	0.15	0.15	0.54
URU	0.01	0.48	0.92	0.02	0.08	0.01	0.18	0.00	0.18	0.25	0.63
GUA	0.11	0.04	0.58	0.14	0.09	0.04	0.01	0.03	0.59	0.22	0.87
RWA	0.19	0.22	0.03	0.08	0.02	0.18	0.13	0.06	0.50	0.07	0.00
SUD	0.18	0.67	0.03	0.08	0.00	0.22	0.09	0.21	0.37	0.19	0.00

Table 6.8. Results of Johansen and Jueselius co-integration test

Cons / Incom	Gambi	Egypt	Sierra	Ghana	Malwi	Hond.	India	Urugy	Guat.	Rwand	Sudn.
ALG	0.05	0.13	0.06	0.06	0.18	0.05	0.12	0.12	0.10	0.00	0.07
ARG	0.15	0.14	0.80	0.34	0.22	0.78	0.47	0.05	0.45	0.44	0.64
BRA	0.24	0.03	0.60	0.34	0.19	0.62	0.49	0.02	0.29	0.20	0.56
CHN	0.31	0.31	0.40	0.36	0.05	0.31	0.18	0.42	0.15	0.09	0.22
CUB	0.10	0.16	0.08	0.04	0.01	0.01	0.02	0.42	0.17	0.00	0.07
COL	0.41	0.00	0.67	0.62	0.20	0.61	0.77	0.48	0.22	0.21	0.84
CRI	0.59	0.39	0.85	0.79	0.34	0.88	0.79	0.08	0.40	0.70	0.87
DOM	0.45	0.08	0.71	0.74	0.42	0.09	0.65	0.36	0.00	0.63	0.86
ECU	0.67	0.22	0.10	0.45	0.11	0.57	0.63	0.70	0.53	0.02	0.69
GUY	0.79	0.23	0.12	0.89	0.51	0.38	0.69	0.94	0.67	0.14	0.29
JAM	0.52	0.86	0.57	0.82	0.56	0.50	0.89	0.57	0.07	0.75	0.95
MEX	0.27	0.68	0.66	0.74	0.44	0.59	0.79	0.50	0.51	0.63	0.76
C AFR	0.02	0.45	0.47	0.38	0.53	0.09	0.37	0.04	0.25	0.46	0.03
PER	0.76	0.36	0.81	0.75	0.53	0.74	0.84	0.72	0.05	0.73	0.99
S AFR	0.19	0.17	0.60	0.44	0.12	0.48	0.53	0.16	0.48	0.20	0.56
THA	0.09	0.21	0.55	0.44	0.23	0.51	0.65	0.03	0.47	0.36	0.38
TUR	0.44	0.18	0.61	0.64	0.11	0.60	0.63	0.05	0.03	0.64	0.89
PAK	0.69	0.07	0.89	0.85	0.01	0.66	0.19	0.76	0.08	0.56	0.59
SRI	0.74	0.45	0.77	0.65	0.35	0.93	0.64	0.79	0.60	0.69	0.85
KEN	0.72	0.39	0.51	0.41	0.03	0.70	0.45	0.70	0.67	0.01	0.31
ZIM	0.42	0.60	0.38	0.10	0.05	0.21	0.10	0.47	0.56	0.20	0.05
ISR	0.39	0.71	0.73	0.66	0.58	0.86	0.81	0.44	0.56	0.60	0.74
ITA	0.00	0.34	0.23	0.12	0.30	0.25	0.28	0.00	0.12	0.26	0.17
INDON	0.48	0.10	0.53	0.36	0.01	0.53	0.44	0.39	0.12	0.13	0.60
BUR	0.66	0.90	0.03	0.37	0.42	0.41	0.62	0.93	0.70	0.44	0.01
FIN	0.00	0.28	0.22	0.09	0.22	0.13	0.17	0.02	0.16	0.09	0.16
GAB	0.03	0.06	0.06	0.03	0.05	0.07	0.06	0.05	0.05	0.00	0.04
MOR	0.13	0.18	0.44	0.26	0.49	0.49	0.51	0.02	0.08	0.19	0.28
MAU	0.49	0.01	0.65	0.14	0.08	0.80	0.42	0.11	0.20	0.17	0.59
DEN	0.00	0.16	0.12	0.09	0.15	0.25	0.29	0.00	0.02	0.09	0.30
BOL	0.84	0.23	0.18	0.06	0.09	0.78	0.42	0.66	0.82	0.29	0.58
CAM	0.12	0.39	0.27	0.14	0.12	0.02	0.14	0.14	0.17	0.10	0.14
CONG	0.41	0.36	0.53	0.19	0.24	0.24	0.34	0.55	0.61	0.02	0.21
GAM	**0.00**	0.63	0.64	0.70	0.53	0.66	0.70	0.30	0.71	0.42	0.56
EGY	0.65	**0.74**	0.67	0.12	0.24	0.98	0.55	0.58	0.04	0.76	0.76
SIE	0.81	0.56	**0.17**	0.48	0.47	0.82	0.68	0.95	0.52	0.10	0.35
GHA	0.73	0.06	0.52	**0.18**	0.14	0.83	0.63	0.47	0.71	0.28	0.29
MAL	0.39	0.44	0.63	0.42	**0.09**	0.56	0.24	0.10	0.14	0.56	0.54
HON	0.68	0.89	0.74	0.74	0.28	**0.78**	0.63	0.86	0.11	0.08	0.78
IND	0.73	0.36	0.75	0.65	0.08	0.78	**0.66**	0.71	0.69	0.12	0.78
URU	0.48	0.40	0.80	0.42	0.33	0.85	0.81	**0.00**	0.50	0.71	0.78
GUA	0.79	0.08	0.52	0.69	0.26	0.20	0.68	0.62	**0.34**	0.29	0.88
RWA	0.44	0.73	0.31	0.39	0.46	0.06	0.11	0.70	0.33	**0.00**	0.00
SUD	0.67	0.78	0.43	0.15	0.07	0.55	0.60	0.78	0.89	0.00	**0.11**

Table 6.9. Results of Co-breaking

Cons / Incom	ALG	ARG	BRA	CHN	CUB	COL	CRI	DOM	ECU	GUY	JAM	MEX	C AFR	PER
ALG	**0**	0	0	0	1	0	0	0	0	1	1	1	0	1
ARG	0	**0**	1	1	1	1	1	1	1	0	1	0	1	0
BRA	1	1	**1**	0	0	1	1	1	0	1	0	1	0	1
CHN	0	0	0	**0**	0	0	1	0	1	0	1	0	0	1
CUB	1	0	0	0	**1**	0	1	1	1	1	1	1	0	1
COL	0	1	0	1	0	**0**	0	0	1	0	0	0	1	0
CRI	1	0	1	0	0	1	**1**	1	0	0	1	1	0	0
DOM	0	1	0	1	0	0	0	**0**	0	1	1	0	1	1
ECU	1	1	1	0	1	1	1	0	**1**	0	0	1	0	0
GUY	0	0	0	1	0	1	0	0	0	**0**	0	1	1	1
JAM	1	0	1	0	1	1	0	1	0	0	**1**	0	0	1
MEX	0	1	0	0	0	0	1	0	1	1	0	**0**	0	1
C AFR	1	0	1	1	0	1	1	1	0	1	1	1	**1**	0
PER	0	1	0	1	1	0	0	0	1	0	0	1	1	**1**
S AFR	0	0	0	0	0	1	1	1	0	1	1	1	1	1
THA	0	0	1	0	1	0	0	0	1	0	1	0	1	1
TUR	1	0	1	1	1	0	1	0	1	1	0	1	0	0
PAK	0	1	0	0	0	1	1	1	0	0	1	0	1	1
SRI	1	0	0	0	0	0	0	0	0	1	0	1	0	0
KEN	0	1	1	1	1	0	1	0	1	0	1	1	1	0
ZIM	0	1	0	0	0	1	0	1	0	1	0	1	0	1
ISR	1	0	1	0	0	0	0	0	0	0	0	0	0	0
ITA	0	0	0	1	1	0	1	1	0	0	1	1	1	1
INDON	1	0	1	1	0	0	1	0	1	1	0	0	0	0
BUR	0	1	0	1	0	0	0	1	1	0	1	1	1	1
FIN	1	0	1	0	1	0	1	0	0	1	0	1	0	1
GAB	1	0	0	1	0	1	0	0	1	0	0	0	0	0
MOR	0	1	1	0	1	0	0	1	1	0	1	1	1	1
MAU	1	0	0	0	0	1	0	0	0	1	0	0	0	0
DEN	0	1	1	0	1	0	1	1	1	0	0	1	1	1
BOL	1	0	0	0	1	1	0	0	0	1	1	0	0	1
CAM	0	0	1	1	1	0	0	1	1	1	0	1	1	0
CONG	0	0	1	0	1	1	0	0	1	0	0	0	0	1
GAM	1	1	1	0	1	0	0	1	1	0	1	1	0	0
EGY	0	0	0	1	0	1	0	0	1	0	0	0	1	1
SIE	1	1	1	1	0	0	1	1	0	1	1	1	0	0
GHA	0	0	0	1	0	1	0	1	1	0	1	1	0	1
MAL	1	1	1	0	1	0	1	0	1	0	0	0	1	0
HON	0	0	0	0	0	1	0	0	0	0	1	1	0	1
IND	0	1	1	1	1	1	1	0	0	1	0	0	1	0
URU	1	1	0	0	0	0	1	1	0	0	1	1	0	1
GUA	1	0	1	1	1	0	0	1	0	1	0	1	1	0
RWA	0	1	1	0	0	0	0	0	1	0	1	1	1	0
SUD	0	0	0	1	0	0	1	1	1	10	0	1	0	0

Table 6.10. Results of co-breaking

Cons / Incom	S AFR	THA	TUR	PAK	SRI	KEN	ZIM	ISR	ITA	INDO	BUR	FIN	GAB	MOR
ALG	0	0	0	0	0	0	1	0	0	0	0	0	0	1
ARG	1	1	0	1	1	1	0	1	0	1	1	1	1	0
BRA	0	0	1	1	0	1	1	0	1	0	0	0	0	1
CHN	1	0	0	1	1	0	0	1	0	0	1	1	1	0
CUB	0	1	0	0	0	1	1	0	1	1	1	0	0	1
COL	0	0	1	1	1	0	0	1	0	0	1	1	0	0
CRI	1	0	0	0	0	1	1	0	0	1	0	0	1	1
DOM	0	0	0	0	1	0	1	1	1	0	0	1	0	1
ECU	0	1	1	1	0	1	1	1	0	1	1	1	0	0
GUY	0	0	0	1	1	0	0	1	1	0	0	0	1	0
JAM	1	0	0	1	0	1	1	0	0	1	1	1	0	0
MEX	0	1	1	1	1	0	0	1	1	1	0	1	0	1
C AFR	0	0	1	0	0	0	0	1	0	1	1	0	1	1
PER	1	1	1	1	0	1	0	0	1	0	0	1	0	0
S AFR	**0**	0	0	0	1	0	0	1	0	1	1	1	1	1
THA	1	**1**	1	0	0	1	0	0	1	0	1	1	0	0
TUR	1	0	**0**	1	1	0	0	0	1	0	0	0	1	1
PAK	0	0	0	**1**	0	1	1	1	0	0	1	0	1	1
SRI	1	0	0	0	**1**	1	0	0	0	1	0	0	0	0
KEN	0	1	1	0	0	**0**	1	1	1	0	1	1	1	1
ZIM	1	0	1	0	1	0	**1**	0	0	1	1	0	0	0
ISR	0	0	0	0	0	0	0	**1**	1	0	0	1	1	1
ITA	1	1	1	1	1	0	0	0	**0**	0	0	1	0	0
INDON	0	0	0	0	1	0	1	0	1	**1**	0	0	1	1
BUR	0	0	0	1	0	1	0	0	0	1	**1**	0	0	0
FIN	1	1	1	0	1	0	1	1	1	0	1	**0**	0	1
GAB	0	1	0	1	0	0	0	0	0	1	0	0	**1**	1
MOR	0	0	1	0	1	1	1	0	1	0	1	1	0	**0**
MAU	1	1	0	1	0	0	0	0	0	0	1	0	1	0
DEN	0	0	1	0	1	1	0	1	1	1	0	1	0	1
BOL	1	1	0	1	1	0	1	0	0	0	1	0	0	0
CAM	0	0	1	0	0	1	1	0	1	0	0	0	1	1
CONG	0	1	0	0	1	0	0	1	0	0	0	1	1	0
GAM	1	0	1	1	0	0	0	0	1	1	1	0	1	0
EGY	1	1	0	0	1	1	1	0	1	0	0	0	0	1
SIE	0	0	0	1	0	0	0	1	0	0	1	1	1	0
GHA	1	1	1	0	1	0	0	0	0	1	0	0	0	0
MAL	0	0	1	1	0	1	1	0	0	0	1	0	1	1
HON	0	1	0	0	1	0	0	0	1	1	0	0	0	0
IND	1	0	1	1	1	1	0	1	0	0	1	1	0	1
URU	0	1	1	0	0	1	1	1	0	1	1	1	1	0
GUA	1	0	0	1	1	1	0	0	1	1	0	1	0	0
RWA	1	1	1	1	0	0	0	0	0	0	1	0	0	1
SUD	0	0	0	1	1	1	0	1	0	1	0	1	1	0

Table 6.11. Results of co-breaking

Cons / Incom	MAU	DEN	BOL	CAM	CONG	GAM	EGY	SIE	GHA	MAL	HON	IND	URU	GUA	RWA	SUD
ALG	0	1	0	1	0	1	0	1	1	0	1	1	0	1	0	0
ARG	1	0	1	0	0	0	1	0	0	0	0	1	1	0	1	1
BRA	0	1	0	1	1	1	1	0	1	1	1	0	0	1	1	0
CHN	1	1	1	0	1	0	0	1	1	0	0	1	1	0	0	0
CUB	0	0	1	1	1	1	0	0	1	1	1	0	0	1	1	1
COL	1	1	0	0	0	0	1	1	0	0	1	0	1	0	1	0
CRI	1	0	0	1	0	1	0	1	1	1	0	1	1	1	0	1
DOM	0	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0
ECU	1	0	0	1	1	0	0	1	0	0	1	0	0	1	1	0
GUY	0	1	0	0	0	1	0	0	1	1	0	0	1	0	0	1
JAM	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1
MEX	1	0	0	1	0	1	0	1	0	0	1	1	0	0	1	0
C AFR	0	1	1	1	0	0	0	0	1	1	0	1	1	1	1	1
PER	0	0	0	1	1	1	1	0	0	0	1	0	0	0	1	1
S AFR	1	1	0	1	0	0	1	0	1	1	1	0	0	0	0	0
THA	0	0	1	0	1	1	0	1	0	0	0	1	1	1	1	1
TUR	0	1	0	1	0	0	0	0	1	0	1	1	0	0	0	0
PAK	1	0	1	0	1	1	1	0	0	1	0	0	0	0	1	1
SRI	0	1	0	1	0	1	0	0	1	0	0	1	0	1	1	0
KEN	1	0	0	0	1	0	1	0	0	1	1	0	1	0	0	0
ZIM	0	0	1	1	0	1	0	0	1	0	1	0	0	0	1	1
ISR	0	1	0	0	1	0	1	0	0	1	0	1	1	1	1	0
ITA	0	0	1	1	1	1	0	1	1	0	0	0	1	0	0	0
INDON	1	1	0	0	0	0	1	0	0	0	1	0	0	1	1	1
BUR	1	0	1	1	1	1	0	1	1	1	1	0	1	0	1	1
FIN	0	1	0	0	0	1	1	1	0	0	0	1	0	1	0	0
GAB	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
MOR	1	0	1	1	0	0	1	1	1	0	1	1	1	1	0	1
MAU	**1**	1	0	1	1	1	0	1	0	1	0	1	0	0	1	0
DEN	0	**0**	0	1	0	1	1	0	1	0	0	0	1	0	0	1
BOL	1	0	**1**	0	1	0	0	1	0	1	1	1	0	1	0	0
CAM	0	1	0	**0**	0	1	1	0	1	0	1	0	1	0	1	1
CONG	1	0	1	0	**1**	0	0	0	0	0	0	1	0	1	0	1
GAM	1	1	1	0	0	**1**	1	1	1	1	1	1	1	0	1	0
EGY	0	0	0	1	1	0	**0**	0	0	0	0	0	1	1	0	1
SIE	1	1	1	0	0	0	1	**1**	1	1	1	1	0	0	0	0
GHA	0	0	1	1	1	1	0	0	**0**	0	0	0	0	1	1	1
MAL	1	1	1	0	0	0	1	1	0	**1**	1	0	1	0	0	0
HON	1	0	0	1	1	1	0	0	1	0	**0**	0	0	1	0	1
IND	0	1	1	0	0	0	1	1	0	1	0	**1**	0	0	1	0
URU	0	0	1	1	1	1	0	0	1	0	1	0	**0**	0	0	1
GUA	1	1	1	0	0	0	1	1	0	0	0	1	0	**1**	0	0
RWA	1	0	0	1	1	1	0	0	1	1	1	0	1	0	**1**	1
SUD	0	0	1	0	1	0	1	1	1	0	0	0	1	0	0	**1**

- ***0 means "no co-breaking" and 1 means co-breaking exist***

Table 6.12. Results of Modified R

Cons / Incom	Alger	Argt	Brazil	China	Cuba	Col.	Costa	Domi.	Ecuad.	Guyn	Jami.
ALG	**0.83**	0.10	0.25	-0.04	0.26	0.37	0.26	0.03	0.28	0.43	0.10
ARG	0.02	**1.00**	0.23	0.05	-0.06	0.22	0.05	0.07	-0.04	0.10	0.02
BRA	0.06	0.15	**0.99**	0.31	0.17	0.57	-0.04	0.21	0.43	0.35	0.34
CHN	-0.07	0.06	0.34	**0.95**	-0.08	0.35	0.18	-0.01	0.04	0.31	0.08
CUB	0.31	-0.10	0.21	0.01	**0.94**	0.29	0.20	0.04	0.16	0.52	0.02
COL	0.24	0.17	0.58	0.31	0.31	**0.99**	0.18	0.45	0.50	0.56	0.31
CRI	0.23	0.03	-0.01	0.07	0.24	0.17	**0.99**	0.08	-0.10	0.06	-0.08
DOM	-0.11	0.04	0.26	0.02	0.16	0.50	0.03	**0.98**	0.23	0.18	0.31
ECU	0.33	-0.04	0.46	0.05	0.17	0.59	-0.11	0.23	**0.97**	0.39	0.06
GUY	0.35	0.03	0.32	0.36	0.37	0.45	0.15	0.10	0.31	**0.88**	0.26
JAM	-0.12	0.03	0.31	0.06	0.00	0.26	-0.03	0.25	0.02	0.42	**0.97**
MEX	0.01	-0.01	0.04	-0.12	-0.08	0.33	-0.04	0.15	0.25	0.28	0.05
C AFR	0.42	0.10	0.27	-0.08	0.10	-0.08	0.26	-0.21	0.05	-0.01	-0.02
PER	-0.18	0.12	0.58	0.19	-0.03	0.55	-0.19	0.42	0.46	0.08	0.17
S AFR	0.21	0.17	0.36	-0.17	0.28	0.44	0.08	0.19	0.21	0.18	0.15
THA	0.06	0.11	0.36	0.06	0.27	0.43	0.21	0.20	0.09	0.16	0.05
TUR	0.27	0.08	0.39	-0.07	-0.04	0.15	0.24	0.05	0.08	0.19	0.34
PAK	0.02	0.18	0.44	0.11	0.22	0.37	-0.39	0.18	0.26	0.37	0.17
SRI	-0.01	0.35	0.32	0.42	-0.05	0.15	-0.02	0.11	-0.11	0.01	-0.02
KEN	0.30	0.02	0.47	0.11	0.27	0.39	0.22	0.11	0.33	0.44	0.06
ZIM	-0.06	0.03	0.18	-0.20	-0.08	0.02	-0.35	0.00	0.09	-0.13	0.02
ISR	-0.26	0.56	0.44	0.08	0.11	0.36	0.08	0.19	-0.12	0.11	0.31
ITA	-0.16	0.12	0.34	-0.14	0.15	0.08	0.37	-0.11	0.02	0.02	0.02
INDON	0.11	-0.02	0.28	0.16	0.17	0.44	-0.05	0.16	0.22	0.30	-0.02
BUR	0.41	0.21	0.46	-0.01	0.36	0.37	0.20	0.10	0.43	0.27	-0.06
FIN	0.27	-0.04	0.50	0.09	0.40	0.16	0.17	-0.20	0.09	0.20	0.19
GAB	0.43	0.16	0.51	0.17	0.22	0.49	0.24	0.20	0.31	0.35	0.10
MOR	0.24	0.11	0.46	-0.09	0.26	0.37	0.43	0.04	0.26	0.22	0.13
MAU	0.02	0.33	0.53	0.03	0.26	0.38	0.08	0.29	0.23	0.31	0.13
DEN	0.26	0.17	0.39	-0.09	0.25	0.25	0.43	-0.05	0.08	0.09	0.09
BOL	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
CAM	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
CONGO	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23
GAM	-0.37	0.39	0.32	0.02	-0.20	0.22	0.19	0.17	0.09	-0.06	0.00
EGY	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45
SIE	0.17	-0.19	0.24	-0.06	0.29	0.45	-0.03	0.10	0.52	0.27	0.02
GHA	0.25	0.11	0.37	0.18	0.26	0.14	0.21	0.11	0.22	0.46	0.11
MAL	0.15	-0.34	0.21	-0.07	-0.18	-0.02	0.08	0.14	0.18	0.08	0.15
HON	0.37	-0.04	0.04	-0.09	0.24	0.34	0.14	0.14	0.25	0.38	0.02
IND	0.43	0.02	0.28	0.09	0.34	0.44	0.20	-0.08	0.19	0.55	0.19
URU	0.11	0.43	0.57	0.01	0.00	0.59	-0.22	0.32	0.39	0.24	0.24
GUA	0.00	-0.10	0.26	0.25	0.11	0.59	0.09	0.33	0.54	0.40	0.16
RWA	0.55	0.03	0.14	-0.14	0.01	-0.08	0.08	-0.03	0.12	0.11	0.10
SUD	0.32	-0.09	0.36	-0.10	0.60	0.16	-0.08	-0.12	0.32	0.34	0.01

Table 6.13. Results of Modified R

Cons / Incom	Mexi	C Afri	Peru	S.Afri	Thai	Turky	Pak	Sri.L	Kenya	Zimb	Israel
ALG	0.15	0.49	0.25	0.33	0.32	0.45	0.39	0.08	0.36	-0.05	0.14
ARG	0.01	0.13	0.13	0.23	0.16	0.12	0.17	0.28	-0.02	-0.03	0.51
BRA	0.09	0.28	0.07	0.40	0.34	0.37	0.44	0.29	0.43	0.19	0.44
CHN	-0.06	-0.06	-0.05	-0.10	0.16	-0.08	0.23	0.57	0.12	-0.35	0.10
CUB	-0.13	0.08	-0.08	0.22	0.30	-0.01	0.27	-0.03	0.29	0.06	0.08
COL	0.26	0.04	0.26	0.45	0.51	0.18	0.41	0.12	0.37	0.10	0.42
CRI	-0.06	0.31	-0.01	0.02	0.21	0.27	-0.28	-0.02	0.25	-0.27	0.04
DOM	0.17	-0.17	0.33	0.25	0.30	0.11	0.18	0.01	0.20	0.09	0.20
ECU	0.32	0.12	0.38	0.23	0.22	0.10	0.33	-0.11	0.39	0.23	-0.01
GUY	0.09	0.15	0.11	0.08	0.19	0.03	0.46	-0.03	0.48	-0.02	0.02
JAM	-0.03	-0.03	-0.06	0.19	0.09	0.32	0.11	-0.07	0.07	0.13	0.40
MEX	**0.99**	-0.19	-0.01	0.12	0.19	0.21	0.25	-0.16	-0.08	-0.06	-0.05
C AFR	-0.19	**0.98**	-0.03	0.17	0.16	0.47	0.23	-0.01	0.30	0.00	0.11
PER	0.22	-0.04	**0.52**	0.34	0.41	0.31	0.29	0.26	0.19	0.15	0.29
S AFR	0.11	0.21	0.00	**0.99**	0.55	0.44	0.41	0.05	0.34	0.20	0.39
THA	0.13	0.19	-0.12	0.53	**0.98**	0.29	0.42	0.18	0.13	0.22	0.49
TUR	0.17	0.54	0.09	0.34	0.19	**0.96**	0.26	0.11	0.28	-0.22	0.17
PAK	0.21	0.16	-0.04	0.48	0.39	0.22	**0.96**	0.15	0.20	0.08	0.28
SRI	-0.11	0.23	0.02	0.20	0.18	0.12	0.14	**0.95**	-0.15	-0.37	0.34
KEN	-0.04	-0.19	0.13	0.30	0.19	0.28	0.26	-0.14	**0.98**	0.17	0.24
ZIM	-0.07	-0.05	-0.09	0.16	0.14	-0.23	-0.04	-0.45	0.05	**0.92**	0.06
ISR	-0.08	0.25	-0.17	0.42	0.44	0.25	0.21	0.37	0.24	0.07	**0.98**
ITA	-0.12	0.03	-0.07	0.43	0.36	0.52	0.00	0.10	0.58	-0.04	0.50
INDON	0.24	0.00	0.12	0.33	0.78	0.00	0.54	0.06	0.06	0.38	0.14
BUR	0.02	-0.05	0.16	0.18	0.21	0.15	0.22	-0.12	0.38	0.40	0.14
FIN	-0.20	-0.26	-0.18	0.41	0.30	0.42	0.18	0.13	0.61	0.02	0.48
GAB	0.23	-0.14	0.08	0.40	0.62	0.51	0.48	0.14	0.53	0.15	0.38
MOR	0.05	0.07	-0.03	0.44	0.49	0.50	0.16	-0.11	0.61	0.06	0.45
MAU	0.07	0.46	0.09	0.57	0.54	0.39	0.44	0.31	0.46	0.07	0.52
DEN	-0.14	-0.01	0.04	0.45	0.46	0.55	0.07	0.14	0.49	-0.12	0.55
BOL	-0.11	0.00	-0.11	-0.11	-0.11	-0.11	0.52	-0.04	0.35	0.24	0.13
CAM	-0.11	0.06	-0.11	-0.11	-0.11	-0.11	0.23	-0.13	0.12	0.03	0.12
CONGO	-0.23	-0.06	-0.23	-0.23	-0.23	-0.23	0.55	0.23	0.43	0.11	0.36
GAM	0.32	0.84	-0.01	0.07	0.27	0.32	0.13	0.02	0.08	0.02	0.29
EGY	-0.45	-0.48	-0.45	-0.45	-0.45	-0.45	0.08	-0.07	0.37	0.10	0.02
SIE	0.18	0.00	-0.12	0.27	0.38	-0.05	0.38	-0.15	0.28	0.26	0.10
GHA	0.00	0.09	0.07	0.27	0.31	0.39	0.36	0.30	0.45	-0.21	0.11
MAL	0.11	0.09	-0.04	0.11	0.32	0.31	0.19	-0.01	0.17	0.29	0.00
HON	0.09	-0.27	0.33	0.16	-0.12	0.07	0.32	-0.25	0.38	-0.06	-0.06
IND	-0.04	-0.53	0.11	0.51	0.33	0.27	0.22	-0.04	0.50	0.07	0.18
URU	0.48	0.20	0.19	0.39	0.26	0.24	0.41	-0.04	0.28	0.26	0.45
GUA	0.41	0.37	0.19	0.15	0.17	0.17	0.42	-0.08	0.27	0.00	-0.08
RWA	-0.10	-0.28	-0.04	0.18	0.01	0.46	0.32	-0.12	0.33	0.17	0.03
SUD	-0.08	-0.21	0.17	0.24	0.02	0.01	0.22	0.15	0.14	-0.04	0.02

Table 6.14. Results of Modified R

Cons / Incom	Italy	Indoni	Burnd	Finlan	Gabon	Morco.	Mauri.	Denm.	Boliv.	Camer	Congo
ALG	0.39	0.25	0.35	0.36	0.56	0.37	0.37	0.38	0.25	0.56	0.45
ARG	0.15	-0.03	0.19	0.02	0.08	0.20	0.16	0.20	0.12	0.08	0.09
BRA	0.32	0.27	0.35	0.52	0.22	0.48	0.32	0.39	0.25	0.09	0.45
CHN	-0.03	0.16	-0.11	0.12	-0.04	0.04	-0.06	0.06	-0.10	-0.37	0.23
CUB	0.15	0.21	0.43	0.39	0.17	0.25	-0.07	0.23	0.13	-0.04	0.15
COL	0.15	0.38	0.28	0.21	0.10	0.47	0.16	0.36	0.36	0.02	0.30
CRI	0.33	-0.18	0.17	0.15	0.28	0.44	0.06	0.42	-0.23	0.12	-0.11
DOM	-0.09	0.12	-0.01	-0.16	-0.03	0.12	0.34	-0.01	0.36	-0.06	-0.06
ECU	0.10	0.32	0.47	0.18	0.32	0.31	0.26	0.19	0.55	0.23	0.46
GUY	0.07	0.34	0.35	0.13	0.18	0.29	0.16	0.18	0.19	0.13	0.27
JAM	0.06	-0.02	-0.19	0.11	-0.08	0.17	0.18	0.15	-0.09	-0.03	-0.14
MEX	-0.10	0.25	-0.01	-0.22	-0.13	0.04	-0.15	-0.12	0.42	0.27	0.06
C AFR	-0.28	0.10	0.39	0.53	0.63	0.50	0.53	0.58	-0.08	0.48	0.35
PER	0.11	0.33	0.07	0.17	0.02	0.23	0.27	0.20	0.34	-0.11	0.26
S AFR	0.47	0.29	0.08	0.44	0.26	0.52	0.37	0.50	0.22	0.42	0.30
THA	0.36	0.66	0.08	0.37	0.27	0.52	0.35	0.46	0.12	0.24	0.25
TUR	0.50	-0.05	0.11	0.42	0.47	0.50	0.53	0.53	0.07	0.43	0.22
PAK	-0.44	0.45	0.24	0.19	0.04	0.19	0.41	0.10	0.45	0.17	0.44
SRI	0.24	0.06	-0.23	0.09	-0.04	-0.11	0.01	0.06	-0.11	-0.14	0.14
KEN	-0.29	0.05	0.42	0.62	0.54	0.61	0.41	0.53	0.29	0.17	0.53
ZIM	-0.42	0.27	0.24	0.01	-0.02	-0.01	0.04	-0.16	0.25	-0.02	-0.10
ISR	0.49	0.03	0.06	0.45	0.23	0.48	0.34	0.50	0.06	0.07	0.25
ITA	**1.00**	-0.04	0.17	0.87	0.74	0.82	0.41	0.91	-0.19	0.44	0.43
INDON	-0.40	**0.96**	0.19	0.08	-0.01	0.22	0.26	0.10	0.27	0.19	0.21
BUR	-0.34	0.18	**0.90**	0.28	0.38	0.37	0.36	0.21	0.38	0.23	0.48
FIN	-0.21	0.03	0.18	**0.98**	0.63	0.68	0.29	0.77	-0.07	0.21	0.49
GAB	-0.36	0.44	0.42	0.57	**0.64**	0.60	0.56	0.51	0.37	0.31	0.48
MOR	-0.46	0.15	0.34	0.75	0.65	**0.98**	0.40	0.90	0.05	0.44	0.36
MAU	-0.34	0.27	0.31	0.53	0.40	0.61	**0.56**	0.55	0.20	0.31	0.61
DEN	-0.19	0.06	0.16	0.82	0.66	0.88	0.39	**0.99**	-0.20	0.41	0.33
BOL	-0.10	0.30	0.29	0.02	0.10	0.11	0.34	-0.07	**0.95**	0.16	0.41
CAM	0.42	0.25	0.16	0.28	0.44	0.46	0.48	0.45	0.19	**0.98**	0.41
CONGO	0.42	0.40	0.26	0.47	0.37	0.36	0.48	0.33	0.36	0.20	**0.56**
GAM	-0.57	0.05	0.24	0.03	-0.02	0.39	0.32	0.21	0.26	0.13	0.33
EGY	-0.10	0.09	0.33	-0.06	0.10	0.08	0.10	0.01	0.39	0.01	0.07
SIE	-0.23	0.38	0.14	0.19	0.10	0.22	0.21	0.09	0.51	0.21	0.41
GHA	-0.21	0.22	0.16	0.45	0.49	0.43	0.44	0.48	0.00	0.33	0.48
MAL	-0.41	0.42	0.11	0.16	0.24	0.22	0.53	0.14	0.14	0.46	0.24
HON	-0.17	0.03	0.35	-0.02	0.02	0.15	0.22	0.06	0.34	0.28	0.29
IND	-0.25	0.30	0.17	0.48	0.34	0.44	0.12	0.47	0.05	0.18	0.28
URU	-0.39	0.25	0.28	0.15	0.10	0.36	0.20	0.25	0.55	0.22	0.29
GUA	-0.31	0.23	0.25	-0.13	-0.14	0.16	0.22	-0.08	0.68	0.01	0.26
RWA	-0.26	0.02	0.34	0.24	0.51	0.14	0.70	0.17	0.31	0.53	0.37
SUD	0.04	0.17	0.32	0.32	0.00	0.08	-0.08	0.16	0.04	0.24	0.41

Table 6.15. Results of Modified R

Cons / Incom	Gam.	Egyp	Sier.	Ghna	Malv.	Hond.	Ind.	Urugy	Guatem.	Rwnda	Sudan
ALG	-0.14	0.39	0.2	0.42	0.27	0.46	0.55	0.30	0.21	0.60	0.31
ARG	0.36	0.18	-0.20	0.14	-0.31	-0.10	0.09	0.25	-0.04	0.05	-0.13
BRA	0.26	0.24	0.24	0.30	0.13	0.03	0.28	0.34	0.29	0.15	0.40
CHN	0.05	0.16	0.02	0.23	-0.02	-0.09	0.10	0.00	0.22	-0.23	-0.05
CUB	-0.29	0.22	0.27	0.25	-0.16	0.20	0.51	0.17	0.12	0.14	0.63
COL	0.17	0.39	0.42	0.17	0.03	0.28	0.46	0.33	0.56	0.04	0.20
CRI	0.15	0.29	-0.02	0.21	0.09	0.05	0.23	0.44	0.08	0.10	-0.05
DOM	0.18	0.21	0.10	0.13	0.14	0.18	-0.01	0.05	0.35	-0.04	-0.08
ECU	0.12	0.26	0.51	0.26	0.22	0.26	0.25	0.15	0.62	0.24	0.34
GUY	-0.13	0.45	0.17	0.52	0.16	0.40	0.56	0.08	0.31	0.29	0.27
JAM	-0.02	0.00	-0.04	0.08	0.12	-0.09	0.16	0.16	0.06	0.06	-0.08
MEX	0.36	0.07	0.30	0.03	0.17	0.09	-0.01	-0.07	0.48	0.02	-0.08
C AFR	0.10	0.14	-0.06	0.38	0.37	0.17	0.33	0.54	-0.13	0.60	0.17
PER	0.32	0.19	0.19	0.19	0.03	-0.05	-0.01	0.23	0.37	-0.16	0.12
S AFR	0.04	-0.02	0.20	0.31	0.18	0.17	0.50	0.50	0.27	0.29	0.24
THA	0.29	-0.03	0.33	0.32	0.33	-0.24	0.23	0.54	0.16	0.02	0.03
TUR	0.25	0.08	-0.05	0.47	0.26	0.10	0.25	0.50	0.17	0.47	-0.02
PAK	0.18	-0.05	0.38	0.29	0.14	0.30	0.11	0.38	0.42	0.23	0.17
SRI	0.04	-0.04	-0.26	0.28	-0.05	-0.26	-0.02	-0.04	-0.08	-0.14	0.06
KEN	0.04	0.40	0.25	0.50	0.11	0.36	0.59	0.37	0.29	0.40	0.25
ZIM	-0.10	0.07	0.16	-0.31	0.14	-0.21	0.06	0.19	-0.14	0.09	-0.01
ISR	0.31	-0.05	0.00	0.13	-0.05	-0.13	0.14	0.39	-0.05	0.05	-0.17
ITA	0.12	-0.12	-0.01	0.48	0.22	-0.05	0.43	0.19	-0.17	0.25	0.05
INDON	0.09	0.16	0.42	0.19	0.50	0.07	0.28	0.24	0.28	0.07	0.15
BUR	0.20	0.41	0.25	0.21	0.19	0.33	0.34	0.39	0.31	0.51	0.41
FIN	-0.12	-0.05	0.13	0.43	0.06	0.00	0.52	0.19	-0.09	0.25	0.32
GAB	0.16	0.21	0.36	0.46	0.42	0.16	0.48	0.36	0.34	0.42	0.03
MOR	0.31	0.05	0.24	0.43	0.23	0.04	0.46	0.45	0.17	0.23	0.06
MAU	0.39	-0.08	0.25	0.71	0.19	0.11	0.25	0.37	0.28	0.17	0.14
DEN	0.13	-0.04	0.02	0.47	0.12	-0.05	0.43	0.30	-0.10	0.18	0.10
BOL	0.24	0.43	0.64	0.17	0.14	0.36	0.19	0.48	0.76	0.37	0.13
CAM	0.17	0.03	0.26	0.38	0.45	0.25	0.22	0.28	0.08	0.57	0.27
CONGO	0.09	0.13	0.37	0.36	0.30	0.37	0.39	0.24	0.31	0.33	0.07
GAM	**0.96**	0.00	0.18	0.15	0.12	-0.09	-0.18	0.46	0.40	-0.02	-0.20
EGY	-0.02	**0.98**	0.02	0.09	-0.07	0.38	0.42	0.42	0.22	0.41	0.29
SIE	0.11	0.01	**0.93**	0.16	0.16	0.17	0.17	0.16	0.58	0.16	0.25
GHA	0.07	0.04	0.09	**0.98**	0.23	0.04	0.32	0.17	0.11	0.27	0.24
MAL	0.16	-0.05	0.22	0.27	**0.97**	0.05	0.15	-0.04	0.16	0.43	-0.03
HON	-0.02	0.42	0.28	0.04	0.07	**0.95**	0.42	0.23	0.43	0.43	0.30
IND	-0.20	0.28	0.11	0.33	0.10	0.30	**0.98**	0.18	0.15	0.28	0.37
URU	0.38	0.39	0.17	0.14	-0.05	0.10	0.16	**0.97**	0.33	0.23	0.15
GUA	0.43	0.24	0.61	0.12	0.19	0.35	0.13	0.32	**0.99**	0.12	0.06
RWA	-0.08	0.32	0.15	0.37	0.43	0.38	0.24	0.15	0.07	**0.95**	0.12
SUD	-0.17	0.21	0.08	0.22	-0.10	0.30	0.38	0.16	0.04	0.20	**0.97**

Note: All the values in MR analysis tables showing the calculated value of MR whereas the critical value noted at 5% level of significance is 0.37.