MACROECONOMIC VARIABLES AND INCOME INEQUALITY NEXUS: TIME SERIES ANALYSIS OF PAKISTAN

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Abstract. Current study attempts to explore the short run and long run relationship among the macroeconomic variables and income inequality by employing the annual data of five decades of Pakistan. Three econometric models have been developed; first model explores the impact of fiscal variables on income inequality while second model tried to investigate the role of monetary variables on income inequality. The third model tried to depict relationship of growth components on income inequality in Pakistan. Study utilized ADF test to check the unit root problem of time series data which shows that variables are stationary on different level of integration. Study used ARDL cointegration approach to check the short run and long run dynamics among the variables. The study used Gini-Coefficient as a proxy variable of income inequality while budget deficit, investment growth, indirect taxes, subsidies, exchange rate, inflation rate, and remittances are fiscal and monetary variables used in this study. Whereas, GDP, rate of unemployment, agriculture growth rate, and manufacturing growth rate are the growth variables used in this study. In long run budget deficit, indirect taxes, and subsidy are negatively related with income inequality while investment growth rate is affecting directly inequality in the first model findings.

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Results of second model depicts that monetary variables also have short run as well as long run relation with income inequality. In long run coefficients of exchange rate, growth rate of foreign remittances, and rate of inflation are affecting inequality positively. Results of third model: growth model investigated the long run relationship where manufacturing growth, log of domestic product, and rate of unemployment are affecting the inequality positively. Furthermore, in the short run agriculture growth rate, manufacturing growth rate log of gross domestic product are significant with income inequality in Pakistan.

I. BACKGROUND OF THE STUDY

Economic inequality is not a unidirectional phenomenon. There are multidimensional factors which can harm or favor level of income distribution in an economy (Cloninger 2016). Some personal factors differentiate individuals from the others with respect to earning like personal capability of labor, gender status and cultural constraints. Some global factors also plays pivotal role to determine income distribution level. These factors are beyond the capacity of individuals. Literacy level of a country, production technologies, development model followed by the government and opening economies are important exogenous factors having significant impact on level of income distribution (Conrad 2017).

The whole countries of the world can be categorized as developed and developing ones. Inside a country, different regions can be divided in the same categories as stated above. Within one region, population can be divided into haves and have not's (Rosentiel 2007). Some of the regions or individuals are lacking resources with compared to their needs whereas, some are lacking as compared to resources of other people or regions. The first dimension is well known in the literature of development economics as absolute poverty. The other is called relative poverty. Different groups in a society are working for their own interest. Some exogenous factors are responsible for income polarization. So, confliction among groups of a society and among different regions of a

country starts due to their own economic interests. There was confliction between east and West Pakistan. May be the cause was regional disparity (Hussain 1993). So, it is core responsibility of state, government or political parties to equally distribute the fruits of economic growth among all segments of society. All this debate is core theme of "Political Economy of inequality" (Busemeyer and Iversen 2014).

In 1947, Pakistan was constituted in an area where, there were fertile lands, rivers and minerals. All the God gifted recourses were abundant for our needs initially (Leyon 2008). The major mode of economic activity was agriculture sector. At that time, Pakistan was not inherited any industrial assets and there was feudal dominance due agrarian structure. Irrigation system of this country was matchless.

During last seven decades, Pakistan attains marvelous developments in agriculture and industrial sector. During 1960s, green revolution and rapid industrialization put Pakistan as example for developing countries. Unfortunately the fruits of economic growth can't be delivered properly to lower pole of society. We are still facing inequality of income, lack of health facilities and problems of political freedom, women empowerment etc.

Due to inherited factor, there are still mega landholdings in rural Pakistan. These people are high "caste" land holders. These people are still influential in decision making or even in government formation. They will have to do work for their own interest. They don't want to scarify for equitable distribution of income, equity of opportunity of reduction of poverty. More than 70 % seats in local or national elections are captured by the feudal in Pakistan (PILDAT 2008). They were able to block tax on agriculture for a long time. This landholding class has their significant share in military decision making bodies. Land reforms were considered a key for reduction of rural poverty in Pakistan but those were also least satisfied.

Pakistan experienced different development strategies for a short while. There seems no continuity of policies (Naqvi 2004). During 1950s, import substitution industries were considered as key to success. However, in next decades, policy makers emphasized upon export promotion schemes for rapid economic development. During the same decade i.e. 1960s, rapid agriculture growth was key to success. In late

1960s, government/state was again confused due to some political factors. Population control, nationalization and islamization of economy were core agenda items during 1970s and 1980s.

Now a days, development economists have started discussion of international poverty. This question was also on the top agenda of MDGs and SDGs. Level of income distribution has polarized the world into high and low income groups. This gap is further increasing between rich and the poor. All the nations of the world possess some degree of inequality. There might be a natural degree of inequality but further worsening inequality is a question for policy makers. This problem is more swerves in developing countries than developed world. During 1960s, the richest 20% of the world was enjoying 70% of income share but in 1990s it has been climbed up to 80 % (World Bank 2016)

Individual countries of the world are possessing different level of income distribution. The most common examples of countries facing heavy income inequality are South Africa, Columbia and Mexico. The countries facing moderate inequality are Libya, Malaysia and Tanzania. For many countries there seems no collinearity between per capita income and level of income inequality (Vogli, Mistry, Gnesotto and Cornia 2005).

The underdeveloped countries have realization to follow developed countries for rapid development. Developed countries have shifted their production possibility curves upward by improving their production techniques which is considered core principle of economic development. Previously Japan was also facing the pace of underdevelopment, but following Germany and France they got developed. The experience of developed countries provides motivation for developing countries to follow others for required development. Asian tigers have also settled example for others because these countries have performed East Asian miracle. In developed countries each segment of population is enjoying benefits of growth. It means their growth experience is accompanied with fairer distribution of income.

On the other hand, many developing countries are accelerating GDP which is accompanied by concentration of wealth (World Bank, 2018). So, economic growth does not seem fruitful for vulnerable people. The case of Pakistan is also not too much distinct from above stated situation.

In Pakistan here is clarity about failure of trickle down mechanism. Approximately 30% population falls below poverty line of single dollar daily income or consumption.

The political leaders are mostly addressing the issue of poverty and inequality in their discussion. Mostly, poverty reduction and provision of basic needs got core importance in political agenda but practically there is no significant improvement. Still people don't have satisfactory educational and health facilities. The governments are looking too much crazy for strong GDP growth rates. For equitable distribution of income, governments will have to intervene significantly through their macroeconomic policies (Mahmood, Rehman and Rauf 2010).

In Pakistan, fiscal and monetary policies are devised in a way that income shifted towards rich people. The income share of bottom 40 % population was gradually declining. Our policies regarding taxation, subsidies, social welfare and public facilities are not in line with pro poor growth. Social, economic and political unrest is not unexpected among poor masses.

In our region some countries like India, China and Sri Lanka have kept in view that income can be accelerated without its concentration in few hands. In countries where resources are centrally possessed by the governments, showed significant improvements in case of distribution of benefits. If maximum resources are privately owned, the rich group will work for their own interest and they will grow at the cost of labor class. The upper group or business class will try their best to minimize wage rates and maximize prices. Pakistan has faced the same situation where business and agricultural elite is much effective in decision making. Decision making role of elite class has made it impossible to grow with distribution. Tradeoff between growth and equal distribution is remained economic reality in our country (Kemal 2005).

Absolute and relative poverty can be reduced by implementing an impressive agenda, which requires the attention of policy makers. But mostly there happens a lag between decision making and its implication. This lag minimizes the effectiveness of policy. Political instability is one major cause for poor implementation of policies because our governments are not sure about their tenure competition. Random variation in developing countries also affects adversely the pace of

development in countries like Pakistan. Unorganized money and good markets are also causes of poor policy outputs.

The current study aims to explore the impact of macroeconomic variables on income inequality in Pakistan by using annual data from 1960-2010, covering the period of five decades. We developed three econometric models; first model explores the impact of fiscal variables on income inequality while second model tried to investigate the role of monetary variables on income inequality. The third model tried to depict relationship of growth components on income inequality in Pakistan.

The rest paper is balanced as; part two discusses the past studies related to the study objectives, part three explains the data sources and empirical methodology. Part four discusses the results of the studies while last part concludes the study and suggests the policy options.

II. REVIEW FROM PAST STUDIES

Khundkar (1973) studied income inequality in Pakistan for the period 1963-64 to 1968-69. He used Gini coefficient as key indicator of income inequality for above stated period after categorizing in to rural and urban areas. He reported rising income inequality in urban areas and declining inequality trend in rural areas. Responsible factor for rising income inequality in urban areas was subsistence wage rate in the manufacturing sector. On the other hand rural worker was enjoying better wages due to increasing yield of agriculture sector. This was impact of "Green Revolution". It means fruits of agriculture output were trickling down during the period of this study. Although this study was a short time series analysis but was a significant contribution. The study by Azfar (1973) started to investigate distribution of income in Pakistan with a doubt that income of elite group is underestimated in Pakistan. So splicing method was opted as a remedy for above stated problem. He made a comparative analysis of Pakistan with other countries. In overall analysis Gini coefficient was reported 0.37 for Pakistan and 0.51 for other countries. Analysis was also decomposed into categories of east/west Pakistan and rural/urban areas for the period 1966-67. It was survey and income tax data. This data also faces limitations like Khadija Haq (1964). Inequality measure showed comparatively good income distribution in West Pakistan as compared to East Pakistan. Similarly rural areas were seemed well as compared to rural areas like Khundkar

(1973). Moreover, Naseem (1973) selected 1963-64 to 1970-71 period to study income inequality in Pakistan. The author preferred real consumption expenditure rather than household income to study inequality. By calculating Gini coefficient, the author reported inverted U- pattern of inequality. Initially inequality measure was climbing from 0.33 to 0.37 but later on it was declining like a secular trend during the period 1966-67 to 1970-71.

Suleman (1973) computed a number of inequality coefficients for 1963-64 and 1968-69. Besides Gini-coefficients he reported inter-quartile range test, coefficient of variation etc. Contrary to the conclusions of a decline in income inequalities reached earlier by comparing Bergan and Azfar studies, Suleman shows an increase in the income inequalities over 5 year period during 1963-64 to 1968-69. Arndt (1975) did empirical work for Indonesian economy. He analyzed the impact of growth on the higher income group and lower income group during 1961-71. For this purpose he worked out per capita income, economic growth, distribution of wealth and income, food production and prices, employment / unemployment and trends in income distribution. The author found that many people of this country were enjoying better living standards which were outcome of government policies during last decade. On the other side many people were facing worse real income and malnourishment. The study by Allauddin (1975) has extended Nassem's study up to 1971-72 and reported Gini-coefficient for income. It may be noted that both expenditure as well as income Gini-coefficients show an increase in the inequalities in the year 1971-72 after a decline in the inequalities up to 1970-71. Haq (1976) commit his policy crime "there exists a functional justification for inequality if it raises production for all and not consumption for a few. The road to eventual equalities may lie through initial inequalities." In 1971, the chief economist, called for distribution policies after the failure of "Trickle Down" mechanism. The main conclusion of this study was that for Pakistan there did not seem to be trade-off between growth and distribution. The economy seems to have performed well in terms of distribution when growth rate was faster and vice versa. But this finding is contradictory to Haq (1976) where he committed the failure of "Trickle Down" mechanism and called for redistribution.

Blider and Esaki (1978) studied the macroeconomic activities and income distribution in USA. They addressed the question of income inequality due to increasing protest against increasing prices. Because increasing prices were considered to create further gap between rich and poor. Actually the authors wanted to determine the role of increasing prices and unemployment on income inequality. The study covers a period of 27 years ranging from 1947 to 1974. Empirical estimation showed that if unemployment rises by one percent, approximately 0.3 % income will move from poorest 40 % towards richest 20 % population of the country. Whereas inflation harms poor class slightly as compared to elite or rich class. It also seems that the effects of inflation are much less important for income distribution than for employment.

Jeetun (1978) examined the inequality trends in Pakistan for the period 1963-64 to 1971-72. Three measures i.e. the Gini-coefficient, Kuznet's measures and coefficient of variation were used for analysis. All these measures indicated an increased income disparity between 1963-64 and 1966-67, then a slight decline during 1968-69 and 1969-70. Again rising income disparity was observed in 1970-71 and 1971-72 in urban areas. On the other hand, four coefficients were used for rural areas. i.e. relative mean deviation, coefficient of variation, Kuznet's measures and Gini-coefficients. Rural income inequality declined between 1963-64 and 1966-67 but rose in 1969-70.Changes in income distribution in Pakistan followed the pattern of rural sector due to its weight in the total population. According to his findings, there was no consistent trend in income disparities over all the years and Pakistan's experience did not support that income distribution is worsened with economic growth.

Kemal (1978) found that Gini-coefficient for the urban areas of Pakistan decreased during 1968-69. Income inequality between rural and urban areas also declined. According to him, this happened due to Green Revolution. Keesing (1980) studied income distribution from outward-looking development policies. He addressed the question that whether inequalities can be reduced by the policies which are suggested to developing countries or not. The analysis suggested that under outward-looking policies, severe inequalities will not generally cure themselves. Except in a few small but relatively advanced countries, income distribution in favor of the poor will not occur automatically, even in the

long run, as a side effect of the development policies that are now being recommended. Inequalities may in some ways increase, and meanwhile inequality is exploited to promote output growth. To cure for inequality in distribution of income, author suggested that what possibly needed is to incorporate systematic measure of redistribution into the outward-looking strategy. It may prove wise to maintain factor prices that reflect the social opportunity cost of different resources in production but correct the resulting income inequalities systematically on the basis of taxes and transfers. It may also prove effective in some places to change relative prices and the mix of output, including public sector demand in order to generate a more intensive demand for unskilled labor.

Ghaffar (1982) investigated the authenticity of the notion that "the Green Revolution has led to exaggeration of income inequality in rural Pakistan". He concluded that there is positive role of green revolution in rural Pakistan to reduce income polarization. Income differential between large and small farms was reduced. It is also concluded that land distribution in Pakistan between 1960 and 1972 reduced the skewness of land ownership which further reduced income inequality. The author suggested that Green Revolution may be supported as a key to economic development. Chaudhry (1982) tried to read rural income distribution from 1963-64 to 1971-72 by calculating Gini-coefficient based upon household personal income and also by using per capita income. The both bases provide measure of income inequality, indicating declining trend during Ayub Khan's regime. The author recommended that land distribution in "Green Revolution" period become fairer, due to this fact income distribution in that period become less skewed among farmers. Again in early 1970s Gini-coefficient shows worsening position of income inequality in rural Pakistan. Gillis, Perkin, Roomer and Snodgrass (1983) examined that during 1960s, Pakistan experienced a fairly rapid industrialization. However, most of the economic activities were concentrated in the western part of the country. The East Pakistan made limited gains; the people felt that the western part was developing at their expense, the result was civil war, the splitting of country in to two parts, within the formation of Bangladesh. In other words, one of the reasons for separation of Bangladesh was the unequal regional distribution of the fruits of economic growth.

Mahmood (1984) calculated inequality measure for both rural and urban areas based on HIES grouped data for the duration 1963-64 to 1979. This study was a pioneer work to discuss inequality trend among 15 years. The value of Gini-coefficient tends to 0.295 from 0.350 during 1963-64 and 1971-72. As similar to previous studies, the author advocated declining income inequality till early 1970s. But in later years of the same decade, income distribution becomes skewed again. Political instability may probably be the root cause of increasing income inequality between 1971-72 and 1979. He further concludes that Kuznet's hypothesis was very much valid for the case of urban areas of Pakistan and not for rural areas. His study also showed that income inequality in Pakistan was lower than other developing countries. Pakistan was ranked third out of twelve selected developing countries.

Ehtisham (1990) examined poverty, inequality and growth in Pakistan. He classified inequality into upper, middle and lower range of distribution. First inequality is due to severe affluence, second type of inequality is among less excessive and third type of inequality is due to severe scarcity. The conclusion of the study was that Pakistan displayed a little change in inequality over the period 1963-85. However the inequality at all Pakistan level takes important changes that might have occurred at the sectoral or regional level. He concluded that income disparities were relatively more intensive in most rural as well as urban areas of NWFP and Baluchistan. Rising income in urban Sindh and Punjab have been accompanied by a reduction in the concentration of the alpha, beta and to some extent of gamma types of inequality.

Besides the determinants of rural poverty in Pakistan, Shahnawaz (1992) analyzed rural and urban income inequality for the period 1971-72 to 1984-85. Based on household income data, the author found increasing income inequality in rural Pakistan as similar to those of Mahmood (1984) and Ahmed and Ludlow (1989) for the period 1979 to 1984-85. However, the author found a declining trend of income inequality in urban areas and a rising trend in rural areas between 1984-85 and 1986-87. These studies were based on published (HIES) data conducted by the FBS, in Pakistan during this period. The behavior of urban poverty is depicted as inverted U-Shaped. Urban inequality measure is slightly upward moving between 1970-71 and 1979 but it shows slight declining trend after 1979. So findings of Malik (1992) are mostly comparable to

Ahmed and Ludlow (1989) although both these studies are based upon different units i.e. household income and household expenditure. Literacy ratio, Dependency ratio, Landholding and households headed by female are core determinants of absolute and relative poverty in Pakistan as expressed by Malik Shahnawaz (1992).

Amjad and Kemal (1997) examine the poverty estimates for the period 1963-64 to1992-93. This study suggested a strategy for poverty alleviation after analyzing the impacts of macroeconomic policies and structural adjustment programs on the absolute poverty in our country. They tried to explore the influence on poverty by the factors like employment opportunities, tax structure, industrial output, terms of trade, price level and overall growth etc. The author seems to be cautious about interpretation of the results due to data limitations. We can compile foremost judgments of the author as follow:

- Foreign remittances are recommended oxygen to remove poverty. Increasing employment opportunities and a heavy growth rate of GDP also plays significant role for poverty alleviation.

- By declining subsidies on agriculture input commodities, there is increasing unemployment and increasing taxes which again pushes vulnerable people into grave of poverty.

- Decline in growth rates, minimized subsidies on agricultural inputs and consumption, increasing unemployment, increasing taxes and reduction in government expenditure on social services has increased poverty in Pakistan.

- To reduce poverty in Pakistan it is necessary to encourage informal sector.

Kemal, Rehana and Rizwana (2001) examined the impact of trade liberalization (reduction in tariff) on income distribution in Pakistan during structural adjustment period by using SAM-based CGE model. Simulation exercises suggested that reduction tariff has following effects

- It reduces price of imported goods.

- Domestic prices will relatively be low

- It will increase demand for goods.

- GDP/ capital ratio increases

- Share of labor in GDP reduces.

- Gap between rich and poor will be increased

- Inequality measure shows worsened income distribution at a marginal rate.

Sarfraz (2001) discussed that the poverty levels and income distribution in Pakistan which were affected by structural adjustment programs. In the history of Pakistan, rising poverty has been witnessed with healthy growth rate, rising poverty with stagnation and also rapid growth with positive impact on poverty. Durring first two decades of Pakistan's history, distributional aspect was ignored and there was total concentration on achieving high growth rate. It was supposed that in later phase there will be trickle down and poor segment of economy will also enjoy the fruits of economic growth. During 1970s there was political instability, rapid industrialization and export of labor force towards Gulf countries. So, incoming remittances become a source of income transfer towards poor people. Again, Anwar (2005) conducted a time series analysis of inequality trends in Pakistan, supported by a logical framework. The author regarded "Growth Strategy" of Martial law regime as major cause of worsening income inequality in Pakistan during 1960s.In early 1980s, income inequality was declined due to increasing real wages and workers remittances belonging to poor class. Again distributional changes in 1990s were caused to increase income inequality. Between 1987-88 and 2001-02 income inequality has risen in both rural and urban Pakistan.

Sadiq and Akhtar (2006) studied the occupational status and earning inequality in Pakistan by using PIHS 2001-02 and PSLM 2004-05. The authors estimated earning inequality for the period 1992-93 to 2004-05. He compared his estimates with Ahmed (2002). Short term trends were also measured for the duration 2001-02 to 2004-05. Rising income inequality was reported by the author for long time period as well as for short time period.

III. DATA AND METHODOLOGY

After a brief literature review and discussion on "correlates" of income distribution, the next step is model specification. As the core purpose of our study is to explore the impacts of macroeconomic policies on income distribution in Pakistan, a combination of fiscal, monetary and investment policy variables is under consideration. A combined accurate analysis of such set of macroeconomic variables is difficult because most of the economic variables move in a same fashion, respect to a specific duration of a trade cycle. Such movement of economic variables may cause spurious or meaningless regression coefficients. So it is necessary to divide these macroeconomic variables into further sub categories or strata. For simplicity and convenience in analysis, the variables are categorized according to macroeconomic policies.

DATA SOURCES AND VARIABLE CONSTRUCTION

The study used annual data of Pakistan from 1960-2010 extracted from World Development Indicators, various publications of Pakistan Economic Surveys, State Bank of Pakistan, and International Financial Statistics. The study used Gini-Coefficient (Gini) as a proxy variable of income inequality while used budget deficit (BDF), investment growth (INVG), indirect taxes (ITAX), subsidies (SUBS), exchange rate (EXR), inflation rate (RINF), and remittances (GFREMIT) are fiscal and monetary variables used in this study. Whereas, GDP (LGDP), rate of unemployment (RUNM), agriculture growth rate (AGR), and manufacturing growth rate (MGR) are the growth variables used in this study. All the variables are taken in local current unit except the growth rates and indices.

EMPIRICAL METHODOLOGY

Unit Root Test

After the descriptive analysis of data, first step of inferential analysis is to check all the time series for their order of integration (I (d)). A series is said to be stationary if it has "zero" order of integration i.e I(0) otherwise if the series is not I(0) then is called non stationary series. A stationary series have constant mean, constant variance and constant covariance.

$$E(Y_t) = \mu \quad \text{...} \quad \text{Constant Mean}$$

$$Var\ (Y_t) = (Y_t - \mu)^2 = \sigma^2 \quad \text{...........................} \quad \text{Constant variance}$$

$$COV\ (Y_t, Y_{t+s}) = \delta s \quad \text{...............................} \quad \text{Constant Covariance}$$

A series that is that is stationary at level is called order of integrated zero I(0), if series is not I(0) it mean there is need to check it for higher order of integration like I(1). I (1) mean that a series that is non stationary at level can be made stationary by differencing it.

It is important to check the order of integration or all time series because the choice of econometric technique to be applied on model is solely an issue of order of integration of all variables. For example if all the time series are I(0) then OLS is suitable model estimation, and if all variables are I(1) then cointegration technique is applied for estimation.

One common way to determine the order of integration of time series is "Unit Root Test". Dickey and Fuller (1979, 1981) introduced technique to determine the order of integration of time series. The Dickey-Fuller (DF) test based on the simple AR (1) model which is as

$$\Delta Y_t = \delta\ Y_{t-1} + \epsilon_t \tag{1}$$

Where, null hypothesis is Ho: $\delta = 0$ and alternative hypothesis is H1: $\delta < 1$. Rejection of null hypothesis implies the presence of unit root ($\delta = 1$) that mean series is not stationary. Two more equations were introduced by Dickey and Fuller (1979) to check the order of integration, one with including constant and one with including trend as well.

Equation for unit root with constant:

$$\Delta Y_t = \alpha_1 + \delta\ Y_{t-1} + \epsilon_t \tag{2}$$

Equation for unit root with constant and trend:

$$\Delta Y_t = \alpha_1 + \alpha_2\ t + \delta\ Y_{t-1} + \epsilon_t \tag{3}$$

Mackinnon (1991) tabulated the critical values for these three models. If the DF calculated value is smaller than the tabulated value then null hypothesis is rejected and series is stationary. DF test suffered from some serious limitations as it is not applicable to those time series

having serial correlation above AR (1). Augmented Dickey Fuller (ADF) and Phillips Perron (PP) test are utilized in this research to check unit root. These tests do not suffer from statistical problems like DF test, and are widely used in time series estimation.

Augmented Dickey-Fuller (ADF) Test

Augmented Dickey-Fuller (ADF) Test is modified form of Dickey-Fuller test. It includes extra P lags of differenced dependent variable and overcome the problem of autocorrelation in dependent variable. The lag length is determined on the basis of minimum Akaike Information Criterion (AIC) or Schwartz Bayesian Criterion (SBC). The general forms of equations in ADF test are as follows:

ADF equation without constant and trend:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{m} \beta_i \, \Delta Y_{t-i} + \varepsilon_t \tag{4}$$

ADF equation with constant:

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^{m} \beta_i \, \Delta Y_{t-i} + \varepsilon_t \tag{5}$$

ADF equation with constant and trend:

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \alpha_2 \, t + \sum_{i=1}^{m} \beta_i \, \Delta Y_{t-i} + \varepsilon_t \tag{6}$$

Here α_0 Represents constant term and "t" shows the trend.

Autoregressive Distributed Lag (ARDL) Approach

The choice of the ARDL bounds testing procedure as a tool for investigating the existence of a long-run relationship is based on some considerations: First and the foremost, both dependent and the independent variables can be introduced in the model with lags. This is a highly plausible feature:

Conceptually, the dependence of the dependent variable on the independent variables may or may not be instantaneous depending on the

theoretical considerations. A change in the economic variables may not necessarily lead to an immediate change in another variable. Hence, ARDL bounds testing approach is appropriate as it allows flexibility in terms of the structure of lags of the regressors in the ARDL model as opposed to the cointegration VAR models where different lags for different variables is not permitted (Pesaran et al, 2001).

It goes without saying that the correct choice of the order of the ARDL model is very important in the long-run analysis. In this respect, the ARDL approach has the advantage that it takes a sufficient number of lags to capture the data generating process in a general-to-specific modelling framework. The ECM incorporates the short run variations by way of long run stability with no loss of long run information. The ARDL process yields reliable and vigorous fallouts both for short run and long run periods. Estimation of ARDL involves two major stages. It tests long run relationship at initial stage and in the second stage long run and short run coefficients are estimated.

The General Form of Unrestricted ECM model in ARDL (p,q,r,x,y,z) formulation:

$$dGINI_i = a_0 + \sum_{i=1}^{p} B_i GINI_{t-i} + \sum_{i=0}^{q} C_i dBDF_{t-i} + \sum_{i=0}^{r} D_i dINVG_{t-i} + \sum_{i=0}^{x} E_i dITAX_{t-i} + \sum_{i=0}^{y} F_i dSUBS_{t-i}$$

$$+\theta 1 GINI_{t-i} + \theta 2 BDF_{t-i} + \theta 3 INVG_{t-i} + \theta 4 ITAX_{t-i} + \theta 5 SUBS_{t-i} + u_t \qquad (7)$$

$$dGINI_i = a_0 + \sum_{i=1}^{p} B_i GINI_{t-i} + \sum_{i=0}^{q} C_i dEXR_{t-i} + \sum_{i=0}^{r} D_i dGFREMIT_{t-i} + \sum_{i=0}^{x} E_i dINF_{t-i}$$

$$+\theta 1 GINI_{t-i} + \theta 2 EXR_{t-i} + \theta 3 GFREMIT_{t-i} + \theta 4 INF_{t-i} + u_t \qquad (8)$$

$$dGINI_i = a_0 + \sum_{i=1}^{p} B_i GINI_{t-i} + \sum_{i=0}^{q} C_i dMGR_{t-i} + \sum_{i=0}^{r} D_i dLGDP_{t-i} + \sum_{i=0}^{x} E_i dRUNM_{t-i} + \sum_{i=0}^{x} F_i dAGR_{t-i}$$

$$+\theta 1 GINI_{t-i} + \theta 2 MGR_{t-i} + \theta 3 LGDP_{t-i} + \theta 4 RUNM_{t-i} + \theta 5 AGR_{t-i} + u_t \qquad (9)$$

Whereas,

- "d" is the first difference operator
- The coefficients of first fraction such as Bi,Ci, Di,Ei,Fi and Gi, correspond to the short run dynamics
- The coefficients θ1,θ2, θ3, θ4, θ5 and θ6 stand for the long run relationships between the variables

- And u_t for white noise error term

Long run relationship is investigated using bound test under the procedure of Pesaran et al. (2001) whose mechanism is based on F-test.

Null hypothesis:

$$H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = 0$$

i.e., that there does not exist cointegration

Alternative hypothesis:

$$H_1: \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq \theta_6 \neq 0$$

i.e., that there exists cointegration

There are some benefits to check cointegration using bound test.

- The test treats each and every one variable as endogenous.

- This test does not consider integration order and can be used for variables I (0) and I (1).

- Both short run and long run coefficient are estimated immediately.

There are three potential conclusions for bounds test:

1. If F-statistics > upper bound   (cointegration exist)

2. If F-statistics< lower bound   (no cointegration exist)

3. If F-statistics lies amid upper and lower bounds →(inconclusive)

The Long Run ARDL (p, q, r, x, y, z) Model

If cointegration is found in the general form of unrestricted ECM model in ARDL (p,q,r,x,y,z) formulation, then subsequent long-run model is projected:

The Short Run ARDL (p, q, r, x, y, z) Model

If the study found long run relationship between the variables the next step is to estimate short run coefficients. The following ECM model is applied to estimate short run relationship between the variables.

$$dGINI_t = a_1 + b_1(ecm)_{t-1} + \sum_{i=1}^{p} B_i(dBDF)_{t-i} + \sum_{i=0}^{q} C_i(dINVG)_{t-i} + \sum_{i=0}^{r} D_i(dITAX)_{t-i} + \sum_{i=0}^{x} E_i(dSUBS)_{t-i} + u_i$$
(10)

$$dGINI_t = a_1 + b_1(ecm)_{t-1} + \sum_{i=1}^{p} B_i(dEXR)_{t-i} + \sum_{i=0}^{q} C_i(dGFREMIT)_{t-i} + \sum_{i=0}^{r} D_i(dINF)_{t-i} + u_i$$
(11)

$$GINI_t = a_1 + b_1(ecm)_{t-1} + \sum_{i=1}^{p} B_i(dMGR)_{t-i} + \sum_{i=0}^{q} C_i(dLGDP)_{t-i} + \sum_{i=0}^{r} D_i(dRUNM)_{t-i} + \sum_{i=0}^{r} D_i(dAGR)_{t-i} + u_i$$
(12)

TESTS FOR PARAMETERS STABILITY

In order to analyze the parameter stability for reliable results Pesaran and Pesaran (1975) proposed CUSUM and CUSUMSQ test which is advantage of ARDL technique.

IV. RESULTS AND DISCUSSION

UNIT ROOT TESTS

By using the methodology as discussed in the previous chapter, this section is going to present empirical findings. The models as specified earlier expresses the econometric picture of macro policy impacts on income distribution in Pakistan for the period 1965-2010. Result shows that all the variables are stationary at first difference except INVG. GINI, BDF, ITAX AND SUBS are not significant at level because its values are below then significant level. GINI, BDF, ITAX are significant at 1 percent level at first difference and SUBS is significant at 5 percent in first difference. INVG is significant at 5 percent level at level.

TABLE 1

Unit Root Results

Variables	Level	1st Difference
GINI	-2.844083	-5.423709*
BDF	-1.710569	-4.252897*
INVG	-3.828938**	-5.512829*
ITAX	2.702611	-4.320225*
SUBS	2.874581	-3.947098**
EXR	-1.250173	-4.244393*

Variables	Level	1st Difference
GFREMIT	-1.935765	-3.931316**
RINF	-3.456371***	-6.066142*
MGR	-2.715918	-7.085122*
LGDP	-1.918171	-4.072295**
RUNM	-3.262379***	-6.262625*
AGR	-5.230893*	-7.769740*

* Significant at 1% level of significance
**significant at 5% level of significance

FISCAL POLICY AND INCOME INEQUALITY

Results indicate that there is existence of long run relationship among the variable GINI, BDF, INVG, ITAX and SUBS because the value of F-statistic is greater than the upper bound that is 4.37 and lower bound is 3.21. There exists one co- integrating equation among the above said variables.

TABLE 2

Bonds Cointegration Results

Variables	F- statistics	Conclusion (HO)
F(GINI/BDF,INVG,ITAX,SUBS)	F(5, 14) = 4.71[.014] I(1)=4.37 & I(0)=3.21	Co- integration
Variables	F- statistics	Conclusion (HO)
F(GINI/BDF,INVG,ITAX,SUBS)	F(5, 14) = 4.71[.014] I(1)=4.37 & I(0)=3.21	Co- integration

The coefficients are estimated with the Schwarz Bayesian Criterion by minimizing the absolute value of Schwarz Bayesian Criterion and Akaik Information Criterion. Probability is given in parenthesis. In long run coefficients budget deficit (BDF), indirect taxes (ITAX) and subsidy (SUBS) all variables are affecting inequality negatively. This means as BDF increases by one unit there will be .6139E-6 unit decrease in inequality and vice a versa. Results of these variables are significant at 1% level of significance. While the variable investment growth rate (INVG) is affecting directly inequality and it is significant at 1% level of significance.

TABLE 3

Estimated Long Run Coefficients using the ARDL Approach

ARDL(4,3,2,4,4) selected based on Schwarz Bayesian Criterion			
Dependent variable is GINI			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
BDF	-.6139E-6	.2199E-6	-2.7922*[.012]
INVG	.4751E-3	.2176E-3	2.1834*[.042]
ITAX	-.1133E-6	.2114E-6	-.53570*[.598]
SUBS	-.1077E-4	.1829E-5	5.8869*[.000]
INPT	.35588	.0039476	90.1519*[.000]

* Significant at 1% level of significance
**significant at 5% level of significance

After testing long run relationship ECM approach is utilized for short run dynamics. Mainly the coefficients are significant in the short run. Budget deficit and investment influenced directly inequality while tax and subsidy influenced indirectly inequality and the results are significant. The value of ECM is -.82414 which indicates that the sign is negative so the model is convergent if there is any disturbance in the model it will converge towards equilibrium and speed of adjustment is 82% and approximately it will take more than one year but less than two years.

TABLE 4

Error Correction Representations for the Selected ARDL Model

dITAX1	-.2464E-5	.3285E-6	-7.5002* [.000]
dITAX2	-.1338E-5	.2836E-6	-4.7180* [.000]
dITAX3	-.7200E-6	.3137E-6	-2.2948* [.031]
dSUBS	-.9328E-6	.7485E-6	-1.2461[.225]
dSUBS1	-.9707E-5	.1391E-5	-6.9789* [.000]
dSUBS2	-.9724E-5	.1453E-5	-6.6923* [.000]
dSUBS3	-.6193E-5	.1171E-5	-5.2877* [.000]
dINPT	.29330	.045862	6.3951* [.000]
ecm(-1)	-.82414	.12617	-6.5320* [.000]

R-Squared	.912	R-Bar-Squared	.815
S.E. of Regression	.00768	F-stat. F(17, 23)	11.628[.00]
Mean of Dependent Variable	.0011195	S.D. of Dependent Variable	.017887
Residual Sum of Squares	.0011221	Equation Log-likelihood	157.1986
Akaike Info. Criterion	135.1986	Schwarz Bayesian Criterion	116.3493
DW-statistic	2.0671		

MONETARY POLICY AND INCOME INEQUALITY

Results indicate that there is existence of long run relationship among the variable GINI, EXR, GFREMIT and RINF because the value of F-statistic is greater than the upper bound that is 4.37 and lower bound is 3.21. There exists one co- integrating equation among the above said variables.

TABLE 5

Bonds Cointegration Results

Variables	F- statistics	Conclusion (HO)
F(GINI/ EXR,GFREMIT,RINF)	F(4, 24)= 4.5442[.037] I(1)=4.37 & I(0)=3.21	Co-integration

These coefficients are estimated with the Schwarz Bayesian Criterion by minimizing the absolute value of Schwarz Bayesian Criterion and Akaik information. Probability is given in parenthesis. In long run coefficients exchange rate (EXR), growth rate of foreign remittances (GFREMIT) and rate of inflation (RINF) all variables are affecting inequality positively. This means as EXR increases by one unit there will be .0011162unit increase in inequality and vice a versa. Results of these variables are significant at 1% level of significance.

TABLE 6

Estimated Long Run Coefficients using the ARDL Approach

ARDL(1,0,0,0) selected based on Schwarz Bayesian Criterion			
Dependent variable is GINI			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
EXR	.0011162	.1881E-3	5.9333*[.000]
GFREMIT	.035511	.012028	2.9523*[.005]
RINF	.1998E-4	.5735E-3	.034844[.972]
INPT	.34435	.0084532	40.7361*

*Significant at 1% level of significance
**significant at 5% level of significance

After testing long run relationship ECM approach is utilized for short run dynamics. Mainly the coefficients are significant in the short run. Exchange rate, growth rate of foreign remittances and rate of inflation influenced directly inequality Results are significant at 1% level of significance. The value of ECM is -.71587 which indicates that the sign is negative so the model is convergent if there is any disturbance in the model, it will converge towards equilibrium and speed of adjustment is 71% and approximately, it will take more than one year but less than two years to bring the disequilibrium into equilibrium.

TABLE 7

Error Correction Representation for the Selected ARDL Model

ARDL(1,0,0,0) selected based on Schwarz Bayesian Criterion			
Dependent variable is Dgini			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Dexr	.7991E-3	.2018E-3	.9596 [.000]
dGFREMIT	.025421	.0096864	2.6244*[.013]
Drinf	.1430E-4	.4105E-3	.034849[.972]
Dinpt	.24651	.052340	4.7098*[.000]
ecm(-1)	-.71587	.14976	-4.7801*[.000]

R-Squared	.38598	R-Bar-Squared	.31960
S.E. of Regression	.014574	F-stat. F(4, 37)	5.8146[.001]
Mean of Dependent Variable	.0010929	S.D. of Dependent Variable	.017668
Residual Sum of Squares	.0078586	Equation Log-likelihood	120.6648
Akaike Info. Criterion	115.6648	Schwarz Bayesian Criterion	111.3206
DW-statistic	2.0531		

GROWTH COMPONENTS AND INCOME INEQUALITY

Results indicate that there is existence of long run relationship among the variable GINI, AGR, MGR, LGDP and RUNM because the value of F-statistic is greater than the upper bound that is 4.17 and lower bound is 3.21. There exists one co-integrating equation among the above said variables.

TABLE 8

Bonds Cointegration Results

Variables	F- statistics	Conclusion (HO)
F(GINI/AGR,MGR,LGDP,RUNM)	$F(5,20)= 4.2911[.019]$ I(1)=4.17 & I(0)=3.21	Co-integration

These coefficients are estimated with the Schwarz Bayesian Criterion by minimizing the absolute value of Schwarz Bayesian Criterion and Akaik information. Probability is given in parenthesis. In long run coefficients manufacturing growth (MGR), log of domestic product (LGDP) and rate of unemployment (RUNM) all variables are affecting the inequality positively. This means as MGR increases by one unit there will be .0031576 unit increase in inequality and vice a versa. There is inverse relationship between AGR and inequality. Results of these variables are significant at 1% level of significance. LGDP is positively related with inequality but it is insignificant.

TABLE 9

Estimated Long Run Coefficients using the ARDL Approach

ARDL(3,2,1,3,2) selected based on Akaike Information Criterion *Dependent variable is GINI*			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
AGR	-.0024106	.0011663	-2.0668*[.052]
MGR	.0031576	.7607E-3	4.1507*[.000]
LGDP	.0019693	.0048572	.40545[.689]
RUNM	.0075709	.0039683	1.9079***[.071]
INPT	.29302	.048605	6.0285*[.000]

After testing long run relationship ECM approach is utilized for short run dynamics. Mainly the coefficients are significant in the short run. Agriculture growth rate, manufacturing growth rate log of gross domestic product are significant at 1% level of significance. The value of ECM is-.3166 which indicates that the sign is negative so the model is convergent if there is any disturbance in the model, it will converge towards equilibrium and speed of adjustment is 32% and approximately it will take three year to bring the disequilibrium into equilibrium.

TABLE 10

Error Correction Representation for the Selected ARDL Model

ARDL(3,2,1,3,2) selected based on Akaike Information Criterion *Dependent variable is DINI*			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dGINI1	.55758	.26861	2.0758*[.049]
dGINI2	.42155	.20579	2.04848[.052]
dAGR	-.7565E-3	.7166E-3	-1.0556[.302]
dAGR1	.0014260	.6313E-3	2.2587*[.033]
dMGR	.0014821	.9529E-3	1.5554[.133]
dLGDP	.037236	.063107	.59004[.561]
dLGDP1	-.065061	.063818	-1.0195[.318]
dLGDP2	.18960	.072624	2.6107*[.015]
dRUNM	.012768	.0043121	2.9610*[.007]

ARDL(3,2,1,3,2) selected based on Akaike Information Criterion			
Dependent variable is DINI			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dRUNM1	-.0092716	.0050770	-1.8262***[.080]
dINPT	.38578	.10577	3.6473*[.001]
ecm(-1)	-.3166	.27495	-4.7884*[.000]

R-Squared	.71626	R-Bar-Squared	.50345
S.E. of Regression	.013201	F-stat. F(11, 24) 4.5897[.001]	
Mean of Dependent Variable .0018583		S.D. of Dependent Variable .018734	
Residual Sum of Squares	.0034853	Equation Log-likelihood 115.2872	
Akaike Info. Criterion	99.2872	Schwarz Bayesian Criterion 86.6191	
DW-statistic	2.1598		

V. CONCLUSION AND POLICY OPTIONS

The current study tried to explore the impact of fiscal, monetary, and growth variable on income inequality in Pakistan by using annual data of Pakistan from 1960-2010 extracted from World Development Indicators, various publications of Pakistan Economic Surveys, State Bank of Pakistan, and International Financial Statistics. The study used Gini-Coefficient as a proxy variable of income inequality while used budget deficit, investment growth, indirect taxes, subsidies, exchange rate, inflation rate, and remittances are fiscal and monetary variables used in this study. Whereas, GDP, rate of unemployment, agriculture growth rate, and manufacturing growth rate are the growth variables used in this study. All the variables are taken in local current unit except the growth rates and indices. We utilized ADF test to check the unit root problem of time series data which shows that variables are stationary on different level of integration. We used ARDL cointegration approach to check the short run and long run dynamics among the variables. We developed three econometric models; first model explores the impact of fiscal variables on income inequality while second model tried to investigate the role of monetary variables on income inequality. The third model tried to depict relationship of growth components on income inequality in Pakistan.

The study found that there is an existence of long run relationship among the variable GINI, BDF, INVG, ITAX and SUBS. In long run

coefficients budget deficit (BDF), indirect taxes (ITAX) and subsidy (SUBS) all variables are affecting inequality negatively. The value of ECM is -.82414 which indicates that the sign is negative so the model is convergent if there is any disturbance in the model it will converge towards equilibrium and speed of adjustment is 82% and approximately it will take more than one year but less than two years.

Results of second model show that that there is an existence of long run relationship among the variable GINI, EXR, GFREMIT and RINF. In long run coefficients exchange rate (EXR), growth rate of foreign remittances (GFREMIT) and rate of inflation (RINF) all variables are affecting inequality positively. The value of ECM is -.71587 which indicates that the sign is negative so the model is convergent if there is any disturbance in the model, it will converge towards equilibrium and speed of adjustment is 71% and approximately it will take more than one year but less than two years to bring the disequilibrium into equilibrium.

The results of third model investigate that there is an existence of long run relationship among the variable GINI, AGR, MGR, LGDP and RUNM. In long run coefficients manufacturing growth (MGR), log of domestic product (LGDP) and rate of unemployment (RUNM) all variables are affecting the inequality positively. There is inverse relationship between AGR and inequality Results of these variables are significant at 1% level of significance. LGDP is positively related with inequality but it is insignificant. The value of ECM is -.3166 which indicates that the sign is negative so the model is convergent if there is any disturbance in the model, it will converge towards equilibrium and speed of adjustment is 32% and approximately it will take three year to bring the disequilibrium into equilibrium.

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APPENDIX

FIGURE 1

Plot of CUSM Model 1

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
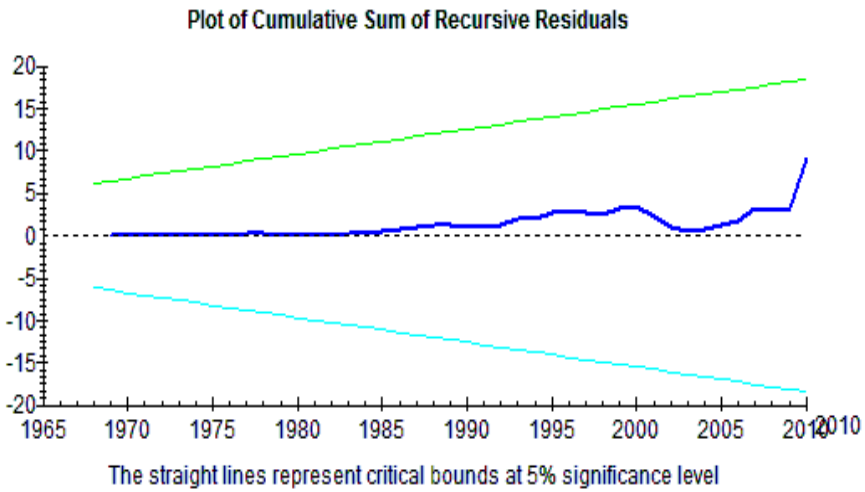
FIGURE 2

Plot of CUSMSQ Model 1

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
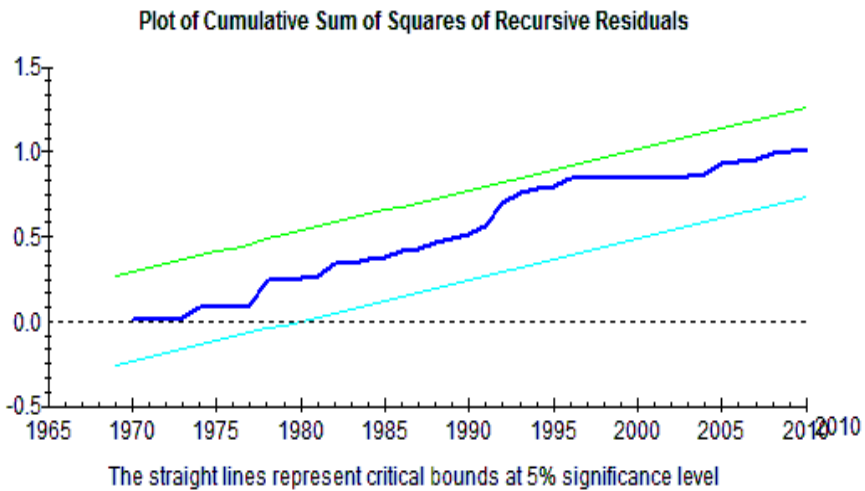
FIGURE 3

Plot of CUSM Model 2

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
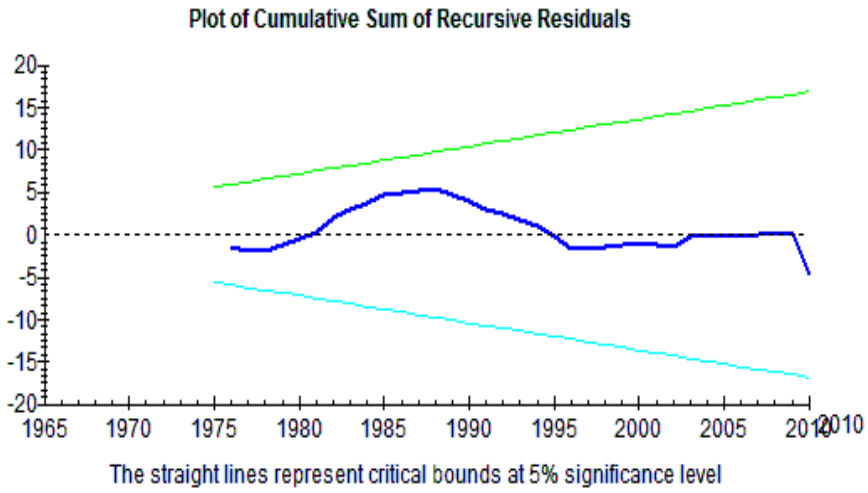
FIGURE 4

Plot of CUSMSQ Model 2

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
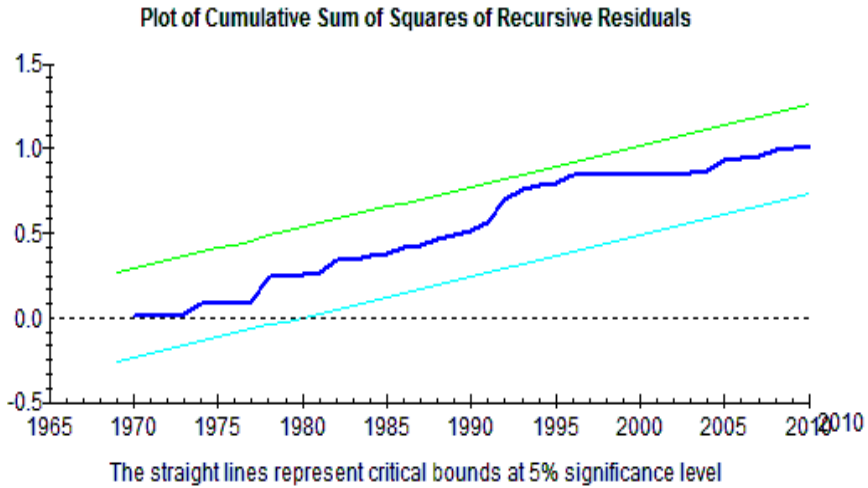
FIGURE 5

Plot of CUSM Model 3

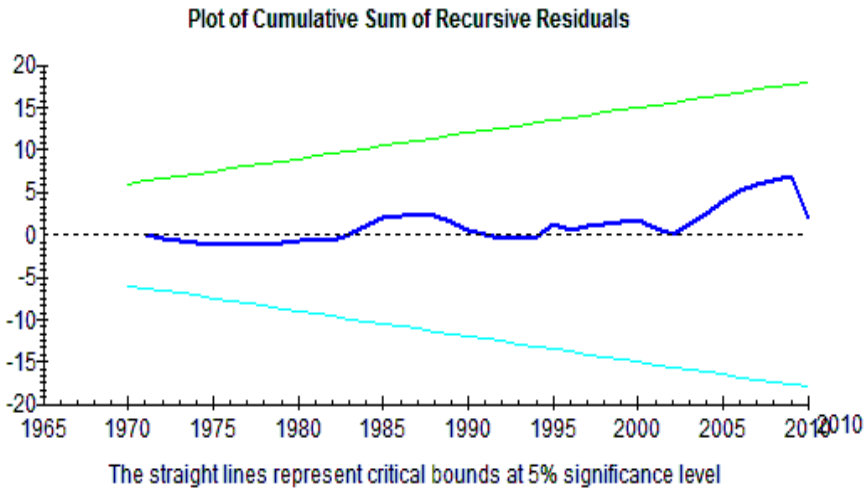**Plot of Cumulative Sum of Recursive Residuals**

The straight lines represent critical bounds at 5% significance level

FIGURE 6

Plot of CUSMSQ Model 3

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level