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MODELING POVERTY TRENDS IN PAKISTAN: SOME ADDITIONAL EMPIRICAL EVIDENCE

SOCIAL POLICY AND DEVELOPMENT CENTRE

MODELING POVERTY TRENDS IN PAKISTAN: SOME ADDITIONAL EMPIRICAL EVIDENCE

By

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I INTRODUCTION

The premise of 'trickle-down' growth rests intimately with the strength and nature of micro-macro linkages with poverty. The theoretical base and empirical evidence that the benefits of economic growth reach the poor and increase their welfare remains inconclusive (McKay 1996). Kuznet's inverted U-shape hypothesis of relationship between income inequality and per capita income/growth is recognized as an empirical regularity rather than a robust test of the 'trickle-down' hypothesis[1]. Even rudimentary empirical validation of the 'filter down' phenomena requires long and consistent time series. In developing countries as consistent data series (even with gaps) becomes available, researchers are increasingly diverting their attention from measurement issues to macro/micro determinants of poverty. Chatterjee (1995) analyzed the impact of sectoral growth rates on poverty status of China, India and Indonesia during the period 1980-90. Datt and Ravallion (1998) identified macro determinants of poverty trends over the period 1960-90 for 15 Indian States. Amjad and Kemal (AK)(1997) provided exploratory and simple empirical evidence about the relationship between macroeconomic policies and poverty in Pakistan.

Using simple econometric techniques this paper extends the AK paper conceptually and empirically to a multi-variable framework, thereby quantifying (yet tentative) relative contribution of various correlates in explaining trends in overall poverty in Pakistan. In the next section we briefly overview the literature on theoretically a priori specified macro linkages to poverty including the findings of AK paper. This section will provide the conceptual underpinning for reduced form modeling of poverty trends in subsequent sections. The use of single variable regression in AK paper is circumscribed by extreme data limitations. In a span of approximately 30 years (1963-64 to 1992-93) their series consisted only of 8 observations on different indicators of poverty or endogenous variables. We use simple yet valid econometric techniques to interpolate and construct a single poverty series which is continuous, lengthy and reflective of poverty trends inferred from the 8 actual observations. Section III is entirely devoted to the methodological issues, limitations and estimation of the interpolated series. Section IV presents the estimation results of reduced form modeling of the interpolated series.

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[1] More recent evidence is provided by Barro (1999). He states, " I find that the Kuznets curve shows up as a clear empirical regularity across countries and over time....I also find, however, that this curve explains relatively little of the variations in inequality across countries or over time".

Head count forecasts below the poverty line for recent years are generated by the above single equation model in Section V . Poverty scenarios over the period 1998-99 to 2002-03 are generated from a large econometric model developed by Social Policy and Development Centre in section VI. Findings are summarized in Section VII.

II DETERMINANTS OF POVERTY IN PAKISTAN

Most of the researchers involved in measurement exercise do provide a testable or subjective explanation/hypothesis of changes in poverty levels over time. In suggesting policy interventions policy analysts and theoretical researchers on poverty identify similar macro and micro correlates of changes in poverty levels. Per capita income or its growth along with remittances is identified as the two most important correlates of overall poverty in the country by majority of researchers.[2] High level of remittances during mid-seventies and in early eighties were a major factor in reducing poverty in that period. Growth in real wage rates, sectoral employment and/or unemployment are identified as the next set of relevant factors[3]. Social safety nets in the form of food subsidies, Zakat &Ushr, Social Action Program are also considered strong correlates of poverty[4]. Moreover inflation exacerbates poverty[5]. Human capital is defined as the stock of useful, valuable and relevant knowledge built up in the process of education and training . Investment in human capital through schooling increases the productivity of labor. Thus ala Sen(1991) human capital is an endowment of a household. Low or poor human capital endowment as stated by Mahmood (1999) can 'compel the household to transact in poor markets which offer more unfavorable price structures compared to rich markets'. To the extent that basic education is considered the prime responsibility of the state, human capital at an aggregate level is an indicator of state's direct contribution in alleviating poverty[6].

Only AK(1997) make a systematic attempt at operationalizing the various macro explanations into observed variables and empirically testing the a prior impacts of macro policies on poverty in Pakistan. Given the very small number of observations the authors employ simple one variable regression. Using a double log transformation they regress one exogenous variable at time on head count series. Real per capita GNP, real remittances per capita, real wages in manufacturing and total labor force as percent of total population are statistically significant at 99 percent and

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[2] See Mahmood (1999), AK(1997), Sayeed & Ghous (1996), Burki (1995), Ercelawn (1992a), Ahmed & Ludlow (1989), Malik (1988).

[3] See Mahmood(1999), Jafri & Khattak (1995) and Husain (1995), Ercelawn (1992b) .

[4] See Sayeed & Ghous (1996), Husain (1995) and Malik (1988)

[5] See Mahmood(1999).

[6] Studies based on household surveys reveal that education level of head of household and females lower the probability of a household being classified as poor. See Shirazi (1995), Ahmad (1998).

have the correct signs. Real subsidies per capita is significant at 95 percent level while labor force in agriculture has the correct sign but is statistically not significant[7].

III GENERATING AN INTERPOLATED POVERTY SERIES

Correlates of poverty are likely to be sensitive to the measure of poverty adopted. In generating an interpolated poverty series we focus on the head count measure of poverty, i.e., percent of very poor population below the poverty line. Malik (1988) generated the first 5 observations during the years 1963-64 to 1984-85, of head count measure from various Household Income and Expenditure Surveys by defining a poverty line based on calorie requirement of 2550 per day plus 'other basic needs of a person'[8]. The methodology proposed by Mujahid (1973) has been used by Malik to estimate the number of persons below poverty line. AK(1997) inflated the poverty line for 1984-85 by the consumer price index and using the same methodology added three more observations for the years 1987-88, 1990-91 and 1992-93 . We reproduce the series given in AK(1997) in Table-1 and plot them in Chart 1. By and large there is consensus among the researchers measuring overall poverty on the shape of the poverty trend depicted in Chart 1. In the sixties calorific poverty increased. Thereafter it continually declined in the seventies and greater part of eighties. Since the late eighties calorific poverty is once again on the rise[9]. A simple interpolation technique is to take the decline or growth in trend between two points in time and fill the data gaps between successive observations. We adopted a slightly more sophisticated method of regressing the log of poverty measure i.e., head count (HHLD) on time trend (TIME). Equation 1 in Table-2 gives the result of estimation and Column 1 in Table-3 gives the interpolated series for the period 1964 to 1993. The estimated trend equation gives an average decline of 2.9 percent annually in the percentage of population below the poverty line (head count). However the interpolated series *fail* to capture the actual turning points specifically around 1970 and 1988. The results of estimating the equation which includes a category variable (DUM88) with a value of -1 and 1 for 1970 and 1988 respectively and zeroes otherwise is given in Table 2 as equation 2. The trend rate of decline in poverty is lower at 2.4 percent annually.

TABLE 1
TREND IN THE PROPORTION OF THE POOR: HEAD COUNT

(%)

Years	
1963-64	40.24
1966-67	44.50
1969-70	46.53
1979	30.68
1984-85	24.47
1987-88	17.32
1990-91	22.11
1992-93	22.40

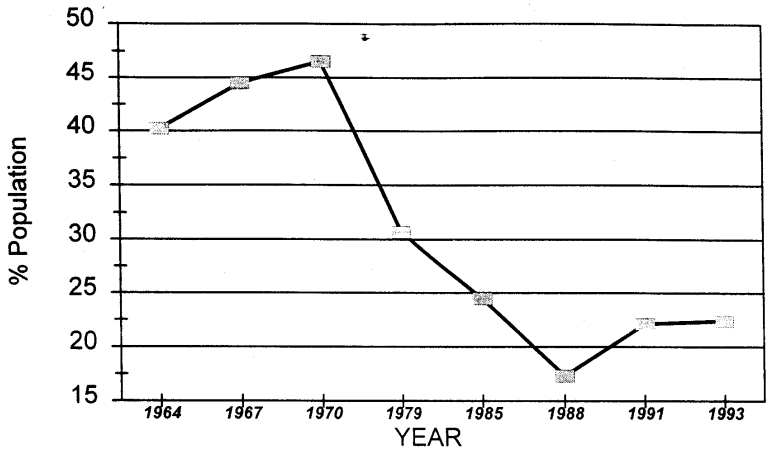
[7] The results of regressing separately inflation, per capita availability of food grains and agriculture productivity on overall poverty are not reported in the paper.

[8] In the estimation of the non-food consumption of the very poor, he used the average ratio of food to non-food consumption of the very poor.

[9] The popularly quoted estimates of head count range from 1/ 4th to 1/ 3rd of the population for the years after 1993.

CHART 1

POVERTY TREND



The interpolated series are given in column 2 of Table-3. The use of dichotomous variable helps to capture the extreme point estimates for the year 1970 and 1988 but *again fails* to capture both sides of peak (1970) and trough (1988) of the observed poverty trend.

The spread of observed data points in Table-1 reveal an interesting pattern. While in a span of 7 years i.e., between 1963 and 1970 there are 3 data points, there is no measured observation or verifiable evidence of poverty status during the decade of 70's. When it is measured next in 1979, poverty declined by almost 16 percentage points. Compare the pre-1970 span with the post-1970 span, which consists of roughly 5 equal spaced observations. From a behavioral perspective this later span is empirically more robust in the sense that not only it captures both sides of the observed U of the poverty trends but there is less probability of major unobserved variations in poverty status during an *average* data gap of 3 years. Equation 3 in Table-2 gives the estimated results of incorporating a time square term to capture the non-linearity in the observed trend. The upturn in the interpolated series (column 3, Table-3) corresponds to the upturn (from 1988) in the observed series and by 1993 the two series manage to converge remarkably well. However the deviation between few of the individual data points are still large, i.e., compare actual 24.47% to 21.60% and actual 17.32% to 20.37% respectively. Equation 4 introduces a calibrated dummy to better capture the trough of year 1988[10]. Corresponding interpolated series are given in Column 4 of Table 3. The declining trend rate of head count measure from equations 3 and 4 are 2.42 and 2.53 percent respectively.

[10] The value of the DUM88 for 5 years between 1986-1990 are 0.25, 0.5, 1.0, 0.5 and 0:25 respectively.

TABLE 2
REGRESSION FOR INTERPOLATING POVERTY TREND

(1) Estimation based on sample 1964-93

Log (HHLD) = 3.9002 - 0.0297 TIME
(35.77) (-5.61)

R^2 = 0.84 S.E.E =0.1593

(2) Estimation based on sample 1964-93

Log (HHLD) = 3.8033 - 0.0242 TIME - 0.2759 DUM88
(69.90) (-8.95) (-4.79)

R^2 = 0.97 S.E.E = 0.0738

(3) Estimation based on sample 1979-93

Log (HHLD) = 6.3433 - 0.2507 TIME + 0.0047 TIME^2
(3.52) (-1.61) (1.46)

R^2 = 0.73 S.E.E = 0.1507

(4) Estimation based on sample 1979-93

Log (HHLD) = 4.8411 - 0.1165 TIME + 0.0020 TIME ^2 - 0.2792 DUM88
(36.80) (-10.17) (8.19) (-22.48)

R^2 = 0.99 S.E.E =0.0095

(5) Estimation based on sample 1979-96

Log (HHLD) = 5.3140 - 0.1583 TIME + 0.0028 TIME ^2 - 0.2283 DUM88
(9. 30) (-3.24) (2.81) (-4.51)

R^2 = 0.97 S.E.E =0.0486

(Figures in parenthesis are t-statistics)

TABLE 3
VARIOUS INTERPOLATED SERIES

Year	Col.1	Col.2	Col.3	Col.4	Col.5
1964	46.56	42.73	NA	NA	NA
1965	45.19	41.70	NA	NA	NA
1966	43.87	40.71	NA	NA	NA
1967	42.58	39.73	NA	NA	NA
1968	41.34	38.78	NA	NA	NA
1969	40.13	37.85	NA	NA	NA
1970	38.95	48.68	NA	NA	NA
1971	37.81	36.06	NA	NA	NA
1972	36.70	35.20	NA	NA	NA
1973	35.63	34.35	NA	NA	NA
1974	34.58	33.53	NA	NA	NA
1975	33.57	32.73	NA	NA	NA
1976	32.59	31.94	NA	NA	NA
1977	31.63	31.18	NA	NA	NA
1978	30.70	30.43	NA	NA	NA
1979	29.80	29.70	31.33	30.68	30.68
1980	28.93	28.99	28.76	29.27	29.23
1981	28.08	28.30	26.66	28.00	27.69
1982	27.26	27.62	24.94	26.89	26.37
1983	26.46	26.96	23.55	25.92	25.26
1984	25.69	26.31	22.45	25.09	24.33
1985	24.93	25.68	21.60	24.47	24.47
1986	24.20	25.07	20.99	22.18	22.96
1987	23.49	24.47	20.58	20.26	20.07
1988	22.81	18.12	20.37	17.32	17.32
1989	22.14	23.31	20.36	19.65	19.58
1990	21.49	22.75	20.54	20.88	20.66
1991	20.86	22.20	20.92	22.11	22.11
1992	20.25	21.67	21.51	22.24	22.08
1993	19.65	21.15	22.32	22.40	22.40
1994	NA	NA	NA	NA	28.64
1995	NA	NA	NA	NA	29.35
1996	NA	NA	NA	NA	30.24

Based on more recent Household Income and Expenditure surveys (HIES), Ahmad (1998) generated two observations for the years 1993-94 and 1995-96. Percentage of households below the poverty line rose to 27 and 31.5 percent respectively[11]. We incorporated these two observations and generated an alternate interpolated series reported in Column 5 of Table 3. Equation 5 in Table 2 is used for generating the 5th series. Note the stark similarities in the interpolated series 4 and 5 for the years 1979 to 1993. To model the trends in overall poverty we replace the interpolated values of series 4 (hereafter denoted as series A) and 5 (denoted as series B) with the measured values for the relevant years given in Table 1[12].

IV MODELING INTERPOLATED POVERTY SERIES

Theoretically the framework of modeling poverty at macro level is challenging as it is in a evolutionary state. Given the micro-macro linkages any macro policy (fiscal, monetary, exchange rate) can be linked to short and/or long run impact on poverty. Ideally these impacts can be captured best in a general equilibrium framework of CGE or macro econometric models. In the context of reduced form modeling the choice of determinants is difficult and at the same time easy. The choice is easy because one can select from a multitude of macro/micro variables and theoretically justify their inclusion. It is difficult because country specific short time series (relevant consideration for the data set of this paper) preclude a rich specification in terms of variables. Since the aim of this paper is to laterally extend the AK(1997) analysis to a multi-variate setting, the choice of some of the determinants in a reduced form specification is guided by their paper. The reduced form model is specified as follows:-

$$HHLDA \ , \ HHLDB \ = \ f\left[PCY \ / \ HHINC \ , \ AGGHCI \ , \ CPIFOD \ , \ RMRPRCP \ , \ U \right]$$

where[13],

HHLDA, HHLDB	=	% of population below the poverty line (series A, series B) .
HHINC	=	Household level GDP (market prices) at 1980-81 prices.
PCY	=	Per Capita GDP (market prices) at 1980-81 prices.
AGGHCI	=	Economy-wide human capital index
CPIFOD	=	Food price index
RMRPRCP	=	Real remittances (cash plus kind) in Rupees per capita at 1980-81 prices
U	=	Open unemployment

[11] Unlike the series 1964 to 1993, there is no corroborative evidence from other researchers of a 4.6 percentage point rise in just one year and another 4.5 percentage point in the next two years. HDC & UNDP (1999) in Table 1.10 quote a head count (defined for Basic Needs expenditure) estimate of 28.7 percent for 1993-94.

[12] It would be presumptuous on our part to assert that the generated interpolated series closely replicate what one would have measured from household surveys if they were conducted for the missing years.

[13] Data sources and construction of some of the variables are detailed in Appendix A.

Empirical support for variants of the above reduced form specification can also be found in pooled cross-section time series studies of countries in Chatterjee (1996) and Barro (1999)[14]. The use of economy-wide human capital index (AGGHCI) as an indicator of quality of stock of human resource merits some description. Chatterjee (1995), Datt and Ravallion (1998) and Barro (1999) have all employed proxies ranging from public expenditures on education to female literacy and school enrollment to capture human resource development (HRD). We have used the AGGHCI developed by the Social Policy and Development Centre to capture the HRD in Pakistan. The Human Capital Index (HCI) captures the quality aspects of labor based on their level of education and professional skills. Data for the development of this index by economic sectors, namely, agriculture, manufacturing and others is based on information on the labor force composition with respect to their skill and education. In addition to this, data on relative wages is employed to assign weights to individual segments to capture the qualitative human attributes. This is based on the premise that in a free competitive market, wage rates at the margin must be equal to the value of marginal productivity of a worker. Presumably, the productivity of labor is a direct reflection of worker education and skill levels. The HCI has been constructed using the wage rate and number of employed persons. The labor force and wage rate are divided into eight separate categories with respect to professional skills[15]. The formula for constructing the human capital index for the 'kth' sector at period 't' is written as:

$$HCI_{kt} = \frac{\sum_{i} L_{k,i,t}(W_{kt}/W_{k,ag})}{L_k}$$

where i = professional occupation, t= time (1 to n), k= sectors, and ag= agriculture worker. Wage of agriculture worker is taken as the numeraire.

At a more theoretical level the above reduced form multi-variate model may be questioned. Mahmood (1999) pointed out that remittances, human capital and unemployment are the determinants of income and their effects are imbedded in the observed or measured incomes. As per Sen(1991) they are endowments of a household and therefore also act as a potential constraint on income[16]. However multi-variate modeling to gauge their individual impact is justified since at a macro level they are truly exogenous to a household. Their path is determined by interplay of monetary, fiscal and exchange rate polices outside the control of individual households. A

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[14] Alternately a 'data exploratory' approach would dictate extensive search for a set of macro determinants which closely mimic (positively or negatively) the poverty profile shown in Chart 1. However this approach is prone to mis-specification. The 'visual' approach applied to the above specification indicated only weak similarities (except real remittances per capita) with the poverty profile in Chart 1. See trend charts of exogenous variables in Appendix B

[15] The eight professional skill categories are:- a) Professional and Technical; b) Administrative and Managerial; c) Clerical; d) Sales Worker; e) Service worker; f) Agricultural Worker; g) Production Worker and h) Other Occupation. Detailed methodology of construction and sources are given in the Appendix A

[16] At an empirical and macro level the influence of remittances on income is insulated as we use GDP rather than GNP.

prior we would expect that (i) higher the household or per capita income (measured at a macro level) the lower would be the percentage of population below the poverty level (ii) lower the level of food prices the lower would be the poverty level (iii) in terms of foreign capital inflow, the higher the real remittances per capita the lower would be the level of poverty, and lastly (iv) higher the level of open unemployment in the country, the higher would be poverty. Descriptive statistics including simple correlations among the explanatory variables are given in Table 4. Note the high correlation between the two income measures and aggregate measure of human capital index (AGGHCI) and CPIFOD. It may be difficult to isolate the temporal impact of other explanatory variables in presence of multi-collinearity among these three correlates[17].

TABLE 4-A
SUMMARY STATISTICS OF EXOGENOUS VARIABLES

	PCY	HHINC	AGGHCI	CPIFOD	RMRPRCP	U
MEAN	4069.99	25916.47	165.83	207.75	250.28	4.27
STD. DEV.	561.45	3242.83	23.39	112.36	104.86	1.01
COEFF. OF VARATION	13.79	12.51	14.10	54.08	41.90	23.75

TABLE 4-B
CORRELATION MATRIX OF EXOGENOUS VARIABLES

	PCY	HHINC	AGGHCI	CPIFOD	RMRPRCP	U
PCY	1.00	0.98	0.98	0.96	-0.69	0.44
HHINC	0.98	1.00	0.95	0.94	-0.73	0.43
AGGHCI	0.98	0.95	1.00	0.93	-0.63	0.35
CPIFOD	0.96	0.94	0.93	1.00	-0.77	0.57
RMRPRCP	-0.69	-0.73	-0.63	-0.77	1.00	-0.55
U	0.44	0.44	0.35	0.57	-0.55	1.00

In Table 5 we report the estimation results from modeling series A. In our estimation exercise we strive for an empirical model which combines supports of theoretical a prior reasoning with better all round fit statistics. In equation 1 real household income, human capital index and inflation in food prices are significant. However a prior identified two key determinants, i.e., remittances and open unemployment are statistically not significant. Their partial impacts are swamped by the multi-collinearity among the remaining first set of three variables. An attempt

[17]Taking first differences or lagged values of exogenous variables may reduce high degree of collinearity among the explanatory variables.

TABLE 5
DETERMINANTS OF OVERALL POVERTY: SERIES A

(1) HHLDA = 73.9405 - 0.0008 HHINC - 0.2745 AGGHCI + 0.0698 CPIFOD
(7.93) (-2.03) (-2.83) (2.28)
- 0.0019 RMRPRCP + 0.5764 U
(-0.27) (1.03)

$R^2 = 0.92$ S.E.E =1.3192

(2) HHLDA = 65.5528 - 0.0011 HHINC - 0.1162 AGGHCI + 0.0288 CPIFOD
(10.31) (-4.08) (-1.55) (1.28)
- 0.0122 RMRPRCP + 0.5657 U - 4.3464 DUM 90
(-2.30) (1.58) (-3.75)

$R^2 = 0.97$ S.E.E =0.8422

(3) HHLDA = 68.5414 - 0.0093 PCY - 0.1142 $AGGHCI_{(-2)}$ + 0.0600 $CPIFOD_{(-1)}$
(18.54) (-2.46) (-1.46) (3.47)
- 0.0085 RMRPRCP + 0.6087 U - 4.0263 DUM 90
(-3.28) (2.37) (-3.22)

$R^2 = 0.99$ S.E.E =0.5543

(4) HHLDA = 72.7928 - 0.0196 PCY + 0.0776 $AGGHCI_{(-2)}$ + 0.0974 $CPIFOD_{(-1)}$
(14.78) (-7.72) (1.31) (5.23)
- 0.0085 RMRPRCP + 1.0893 U - 0.6778 DUM 79
(-2.44) (3.89) (-1.53)

$R^2 = 0.98$ S.E.E =0.7383

(Figures in parenthesis are t-statistics)

to capture the 1988 turning point, i.e., the observed trough in Table 1 by a dummy variable (DUM90), erodes the significance of AGGHCI and CPIFOD (Equation 2) while capturing the individual impact of remittances and open unemployment. The third estimated model on series A is a lagged version of equation 2. Introducing a two year lag impact of human capital and one year lag impact of food inflation on poverty ranking is theoretically more plausible than immediate response implied by the estimates of equation 1 and 2. Moreover we replace household income with per capita income, a relatively more meaningful correlate of head count poverty ranking rather than household income[18]. Lagged aggregate human capital index

[18] However using household income as a correlate of poverty in large extended households is also defensible. Economies of scale in expenditure, earners pooling income and intra-household support system does reduce the probability of individuals touching the poverty line.

(AGGHCI) is significant at 80 percent level with a correct sign. All other variables are highly significant. The fit statistics including durbin-watson statistic is better than the other two models. Note that directional impacts conform to a prior premises and are robust across all the three formulations. In the last equation of Table 5, the turning point dummy for 1988 (DUM90) is replaced by another dummy (DUM79) with a value of 1 for all observed data (including the turning point in 1988) and 0 for interpolated values in series A. The interpolated values are not statistically different from the observed values at 16 percent confidence level[19].

The results of estimating the above reduced form models on series B are given in Table 6. Comparing with results obtained for series A we note the following:- i) The performance of equation 1 for both series is almost identical. Without the dummy variable, significance of remittances and open unemployment is over shadowed by the strong correlations among the

TABLE 6
DETERMINANTS OF OVERALL POVERTY: SERIES B

(1) HHLDB = 75.0508 - 0.0007 HHINC - 0.2950 AGGHCI + 0.0749 CPIFOD
(9.34) (-2.19) (-3.52) (2.84)
- 0.0015 RMRPRCP + 0.4836 U
(-0.24) (1.002)

$R^2 = 0.94$ S.E.E =1.1370

(2) HHLDB = 67.5006 - 0.0010 HHINC - 0.1525 AGGHCI + 0.0380 CPIFOD
(13.44) (-4.76) (-2.57) (2.14)
- 0.0107 RMRPRCP + 0.4739 U - 3.9124 DUM 90
(-2.55) (1.68) (-4.28)

$R^2 = 0.98$ S.E.E =0.6654

(3) HHLDB = 67.8933 - 0.0112 PCY - 0.0652 $AGGHCI_{(-2)}$ + 0.0644 $CPIFOD_{(-1)}$
(14.93) (-2.42) (-0.68) (3.02)
- 0.0086 RMRPRCP + 0.6816 U - 3.3106 DUM 90
(-2.71) (2.16) (-2.15)

$R^2 = 0.98$ S.E.E =0.6818

(Figures in Parenthesis are t-statistics)

[19] The 1988 turning point dominates in this result. If excluded the alternate hypothesis of no difference between the values is accepted at 65 percent confidence level.

remaining three determinants. In other words remittances and unemployment fail to adequately explain the turning point in the poverty trends. Moreover the significance of AGGHCI and CPIFOD may be a statistical artifact or spurious because of high correlation rather than a true behavioral relationship. ii) Model specified in equation 2 of Table-6 performs remarkably well in relation to its counterpart in Table- 5. Except open unemployment all the variables are significant above the 90 percent level. iii) Model specified in equation 3 performs marginally poorly in comparison to corresponding equation 3 of Table-5. Two year lagged aggregate human capital index is not statistically significant but has the correct sign. Standard errors of other coefficients are slightly larger in the estimates for series B.

We quantify the impact of exogenous variables on poverty levels as obtained from equation 3 of series A and equation 2 of series B. The impacts around mean values are reported in Table-7. A 5 percent increase in real per capita income lowers the head count ratio by 1.87 percentage

TABLE 7
IMPACT OF MACRO DETERMINANTS ON POVERTY

	Series-A Equation-3	**Series-B Equation-2**
5 Percent Increase in Real Per Capita Income	-1.87 (-1.58)*	-
5 Percent Increase in Real Household Income	-	-1.27 (-1.09)*
10 Percent Increase in Real Remittances Per Capita	-0.27 (-0.09)*	-0.2 (-0.11)*
10 Percent Increase in Food Prices	1.24 (0.52)*	0.79 (0.33)*
10 Percent Increase in Aggregate Human Capital Index	-1.89 (-.080)*	-2.54 (-1.07)*
½ Percentage Point Fall in Unemployment	-0.3 (-0.11)*	-0.24 (-0.09)*

(Note: The figures in parenthesis are elasticities)

points. A 10 percent increase in real remittances and half percentage point drop in open unemployment have similar impacts on poverty reduction in both the models. While lagged as compared to short- run increase in food prices have larger impact on poverty, it is the opposite for human capital index. For series A it is interesting to note that 5 percent increase in real per capita income in the short run and 10 percent increase in aggregate human capital index two years ago have equivalent impact on the current poverty levels in the country. Under each of the level impacts we also give in brackets the unitary elasticities with respect to each of the determinants. The elasticity is greater than one only for both measures of income, while closer to one for human capital index (AGGHCI). Poverty is inelastic to food prices, unemployment and remittances.

In designing policy interventions to mitigate poverty it would be more meaningful to assess the relative contribution of these determinants to poverty status during the decade of eighties and nineties. Table-8 gives the relative contribution of each exogenous variable as estimated from the two selected models. In the eighties real per capita contributed significantly followed by human resource development to the reduction in poverty. These positive contributions were only partly offset by increase in food prices and slow down in remittances. In the nineties the contribution of inflation in food prices, lower remittances and higher unemployment to increase in poverty outweighed the mitigating effect of increase in per capita income and human capital index[20]. Set of estimates for series A and B present a consistent profile of direction of contribution to poverty trends. They only differ in relative importance of each determinant. In estimates from series A the lagged impact is higher than the current impact of food prices as in series B. Similarly the contribution of human resource development is projected more in the latter than in the former equation. Conversely is the case with the income variables.

TABLE 8
IMPACT OF MACRO DETERMINANTS ON POVERTY

	SERIES A: EQUATION-3	
	Decrease in Poverty (Decade of 80's)	**Increase in Poverty (Decade of 90's)**
Real per Capita Income	78	-103
Aggregate Human Capital Index	25	-9
Food Prices	-31	167
Remittances Per Capita	-5	22
Unemployment	2	36
	SERIES B: EQUATION-2	
	Decrease in Poverty (Decade of 80's)	**Increase in Poverty (Decade of 90's)**
Real Household Income	58	-21
Aggregate Human Capital Index	43	-74
Food Prices to change	-21	111
Real Remittances Per Capita	-6	27
Unemployment	1	27

These impacts also have implications for the ongoing debate on the nature of poverty in Pakistan, i.e., transitory versus chronic poverty[21]. What do the above contributions imply for the nature of anti-poverty macro economic policies? In the nineties mainly inflation in food prices

[20] The contributions of all the explanatory variables may not add to 100 percent as there is some proportion of unexplained variation in the equations.

[21] See Baluch, B. and N. McCulloch (1998).

contributed to rising poverty in the country. Thus across the board withdrawal of wheat subsidy under the new WB/IMF program needs to be tempered with well targeted social safety nets for the very poor. Allocations to labor intensive public works programs in Public Sector Development Program is another policy instrument that can effectively reduce growing unemployment and thereby alleviate poverty in the rural areas.

V BACK AND FORE CASTING POVERTY

The advantage of using a subset of 5 observations (1979-1993), out of total of 8 to interpolate and then model the series is that the left out observations (1964-70) can be used to test the reliability of the estimated model and assess the deviations between the back casted and the actual measured values. Table-9 compares the actual values for 1969-70 and 1966-67 with the back casted values for the corresponding years. As the numbers in the table reveal both the

TABLE 9
COMPARISON BETWEEN ACTUAL AND BACK CASTED VALUES 1966-67 AND 1969-70

Year	Actual Value	Back casted value (Based on Equation-3) Table 5	Back casted value (Based on Equation-2) Table 6
1966-67	44.50	38.05	43.00
1969-70	46.53	35.00	39.83

equations are only partly successful in explaining the dramatic decline in poverty during the seventies. The deviations between the back casted and observed values are greater for equation 3 estimated from series A than from estimated equation 2 based on series B. The series A and B estimated equations predict only a 5 and 9 percentage point fall respectively against a 16 percentage point fall observed from household surveys. One explanation is that the measured remittances data at the macro level may contain sizable measurement error as compared to the survey data captured at the household level. To explain the rapid decline in poverty in the seventies the results also suggest an 'exploratory approach' to identify few more macro indicators beyond the ones already included in this research.

We used the results of estimation exercise, and availability of actual data on macro variables for the period 1994-1998 to predict the head count ratio for the period outside the estimation period[22]. In Table-10 we report the forecasted series from equations 2 &3 of series A and B respectively. Head count forecasts from modeling series A range from 23.04 percent in 1994 to 29.33 percent in 1998 for both the equations. Forecasts from modeling series B are remarkably

[22] For years 1994-98 only AGGHCI has been extrapolated based on past growth rate.

TABLE 10
FORECASTING POVERTY LEVEL: 1994-98

Years	FORECAST OF SERIES A		FORECAST OF SERIES B	
	PCY	HHINC	PCY	HHINC
1994	23.71	23.04	24.08	23.12
1995	23.90	23.43	24.43	23.72
1996	25.87	24.10	26.66	24.42
1997	28.55	25.69	30.13	26.13
1998	29.33	25.02	31.18	25.60

close with those of series A and range from 23.71 percent in 1994 to 31.18 percent in 1998. In both the models with household income, notice slight fluctuation in head count during 1996-98 period, while in models with per capita income the head count ratio exhibits a smooth rising trend. Over the 5 year period there is an increase in head count ratio of 1.98 and 5.62 percent from modeling series A. Corresponding increase from series B is 2.48 and 7.1 percent respectively. Given that estimates from modeling series B exaggerate the immediate impact of human capital index, i.e., they are even larger than the impact of current increase in real household income, and a prior appealing hypothesis of delayed response of human capital index and inflation in food prices, the authors are inclined towards ranking equation 3 from series A as the most meaningful model from behavioral and forecasting perspective[23].

VI WB/IMF PROGRAM AND POVERTY LEVELS

As mentioned earlier most of the correlates used to explain overall poverty trends during 1979-93 are an outcome of simultaneous interplay of fiscal, monetary, exchange rate and social sector policies in the country. As in many developing countries, there is an on-going debate in Pakistan whether the turning point of head count ratio observed after 1988 (see Table-1 and Chart 1) was the result of half-heartedly implementing the WB/IMF structural adjustment programs since 1988. In absence of any *counterfactual* empirical evidence it will be difficult if not impossible to unambiguously establish the direction of causality running from adjustment program to increase in poverty in Pakistan. On a more technical level, such an empirical validation requires a general equilibrium framework capturing the simultaneous nature of feedbacks of various government policies and private behavior on economic performance and poverty. Fortunately a large macro-econometric model developed by Social Policy and Development Centre is in

[23] A lagged response to increase in food prices may be plausible because a) of slow adjustment of dietary habits to immediate increase in food prices, thereby reducing current saving rather than food expenditure or quantities, b) carry over of food stocks specifically in rural areas.

operation since 1995[24]. Summarily, the model consists of 265 equations including 129 behavioral equations. These equations are subsumed into 25 blocks, which in turn are subsumed into 3 inter-linked and inter-dependent modules, i.e., macro, public finance and social sector modules. We use the ISPM model to generate two long-run poverty profiles[25]. The first relates to a *counterfactual* scenario, i.e., if Pakistan had not conducted the nuclear blasts in May 1998 and economy had continued with the 'softer' ESAF/EFF program signed in October 1997. The second scenario assesses the long-run impact of ESAF/EFF program and Debt rescheduling agreement (concluded in Jan 1999) on the poverty profile[26]. A set of two behavioral equations including equation 2,(Table-6)estimated from series B and 3 identities constituted the poverty block (see Appendix C for the specification of the poverty block) . As all variables exogenous to the poverty block are endogenously determined by the main model, it was attached to the main model as satellite block in order to utilize the estimates of endogenous values obtained from simulating the two growth paths[27]. The poverty profiles (% of population below the poverty line) generated from the model for counterfactual scenario and WB/IMF program are given in Table-11.

TABLE 11
COMPARISON OF A SOFT & TOUGH ESAF /EFF PROGRAM

Year	Counterfactual	ESAF/EFF	Difference
1999	28.02	29.45	1.43
2000	27.42	29.81	2.39
2001	26.79	29.67	2.88
2002	26.05	29.34	3.29
2003	25.11	28.50	3.39

Before one dilate on the results of the two simulations it will be useful to briefly mention the two main differences in policy 'shocks' between the 'soft' and 'tougher' ESAF\EFF Program. A) The tougher program signed in January 1999 stipulates a phasing out of wheat subsidy by FY2000. B) It enhances the tax incidence on petroleum products. In terms of our poverty modeling the first

[24] See Integrated Social Policy and Macro- Economic Planning (ISPM) Model for Pakistan, Research Report No.7, June 1995, for structure, specification, estimation and working of the Model.

[25] The inadequacies of CGE models for generating policy advice from counterfactual scenarios as mentioned by Robinson (1991) may be equally valid for macro econometric models. For CGE models he argues, "these models are useful for increasing our understanding but that, because of the assumptions regarding parameter values and reaction coefficients, it is improper to use them for detailed policy advice".

[26] For details on assumptions, trends of exogenous/policy variables and specifications employed to model both the scenarios, see Social Development in Pakistan, Annual Review 1999 and 'Alternate Macro Economic Scenarios' SPDC Publications, Research Report (forthcoming).

[27] Poverty block can be interpreted as a set of recursive equations as the poverty estimates generated from these equations do not feed into any of the equations of the main model. In future we also plan to endogenize this important indicator of social development.

shock feeds in directly to increase in food prices while the second shock raises the overall price level with second round impact on food price level. However a prior the impact on poverty remain ambiguous as poverty alleviation impact of these policy shocks transmit through lower budgets, less monetary expansion and less inflation[28].

A look at the head count ratio in the above table reveals that 'softer' ESAF/EFF program would have gradually reduced the population below the poverty line. The new tougher program after the blasts will initially increase poverty in the first two years and then gradually bring about reduction as structural reforms take root in the economy. Moreover the difference in the incidence of poverty increases between the two scenarios. These trends provide tentative empirical evidence in support of the observation by Hoeven (1995), "In short, the relationship between stabilization policies and poverty depends on the combined effects of fiscal policies (in general negative), monetary policies (usually negative), wage policies (usually negative) and devaluation (negative or positive depending on the specific situation). Combining these effects, it can be safely argued that stabilization policies usually *increase poverty, at least in the short run*". Should the additional increase in poverty be attributed to the tough design of the program per se or the nuclear blasts which lead to sanctions thereby motivating the IFIs to dictate a tougher program? The present writers feel that latter is a more plausible explanation of higher costs in terms of poverty enhancement.

VII Summary and Policy Implications

In this paper, an attempt has been made to quantify and document the impact of different macro economic correlates of poverty. Using interpolation techniques the gaps in head count series developed by Malik(1987) and AK (1997) have been filled to facilitate the development and empirical testing of a multi-variate reduced form model. The estimates of various versions of the reduced multi-variate model on explaining poverty trends during 1979-93 confirm that per capita income, remittances, and unemployment not only impact independently, as revealed in AK(1997) study but also impact jointly. In addition inflation in food prices exacerbates poverty with a one year lag. This study for the first time in case of Pakistan documents the poverty alleviation affect of households endowments as mentioned by Sen (1991). Household endowment are captured at the macro level through the construction of aggregate human capital index. In fact the lagged impact of improvement in human capital index is almost equal to the current impact of measured income. While economic policies affecting current income may reduce transitory poverty, social policies aimed at improving endowments of the society will be equally effective in reducing chronic poverty in the long-run.

The findings of relative contribution of incomes, human resource development and inflation in food prices to decrease/increase in poverty during seventies and eighties respectively suggest broad contours of an anti-poverty macro economic policy. A non-inflationary macro policy that aims at stimulating employment through increased capacity utilization (both in industry and agriculture) would reduce poverty via increase in incomes. In a low inflationary environment an

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[28] See Chart 3.3 in Social Development in Pakistan, Annual Review 1999 for detailed a prior impact analysis of various WB/IMF conditionalities on poverty.

easy monetary policy would help in achieving this objective. Given the employment-inflation trade-offs, a tight fiscal policy aimed at reducing subsidies drastically or taxing daily use items would hurt more than the boost to employment by the increased outlays on capital intensive mega projects or even public works programs in rural areas.

It is well recognized that macro policies are limited in their direct impact on alleviating poverty via influencing the incomes and livelihood of very poor. However under the compulsions of reducing budget deficit in times of slow growth, expenditures are reduced rather than increasing taxes. In these periods, social safety nets as vital component of *mesopolicies* assume added significance. Targeting efficiency of social safety net program e.g., food stamps, direct cash transfers need to be enhanced to counter the poverty enhancement impact of stringent fiscal policy. As Hoeven (1995) remarked, "An evaluation of tax and expenditure policies reveals that whether or not macro-economic policies favor the poor depends not on the macro-economic policies themselves but on the social situation in the country, especially whether a society is willing to give priority to distributional issues in times of economic crisis".

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APPENDIX A
DATA SOURCES AND CONSTRUCTION OF VARIABLES

PCY = GDP (market prices) at 1980-81 prices divided by population(POP).
HHINC = PCY * Household Size (HHSZ).
AGGHCI = (HCIA *LA + HCIM * LM + HCIOT * LOT)/(LA + LM + LOT)
where HCIA, HCIM, and HCIOT are Human Capital Index in agriculture, anufacturingand Other sectors respectively. LA, LM, LOT are labor force in agriculture, manufacturing and other sectors respectively.
CPIFOD = Consumer Price Index of food prices (Base 1980-81=100)
RMRPRCP= [Cash remittances (RMC$) + remittances in Kind(RMK$)] *
e/[POP * Price index of Imports, Base 1980-81=100, (PIIMP)].
U = Open Unemployment
GDP, POP, LA, LM, LOT, CPIFOD, RMC$, e (Pak Rupees per US $), PIIMP, and U are obtained from various past issues of the Pakistan Economic Survey. Remittances in kind in US$ terms are valued at 23 percent of Cash remittances in US$. HHSZ is based on periodic Household Income and Expenditure Surveys and Housing Surveys. To construct a continuous series of HHSZ the missing values are interpolated using average annual growth rates.

Methodology for Construction of HCI

The human capital index has been constructed for three sectors namely, Agriculture, Manufacturing and Services (other sectors). Primarily the major source of data is Labor Force Survey published by the Federal Bureau of Statistics, Government of Pakistan. These surveys provide data at both urban and rural level. The labor force survey delineates information on the following indicators:-

(a) Percentage distribution of employed person of 10 years age and above by major industry division and major occupation groups.

(b) Percentage distribution of employed person of 10 years age and above by literacy level of education and major occupation groups.

The literacy level of education published by the Bureau of Statistics is slightly different from our definition. We have considered a particular level of education acquired only after its completion.

By using these two tables we compute the percentage distribution of employed persons of 10 years age and above by major industry division and literacy level of education. Another table related to percentage distribution of population of 10 years age and above by literacy level of

education is published by the same department. By assuming that the percentage distribution of population is approximately similar to the percentage of employed persons of 10 years age and above we have constructed tri-variate table which shows the percentage distribution of employed persons of 10 years age and above by major industry division, level of education and by age groups.

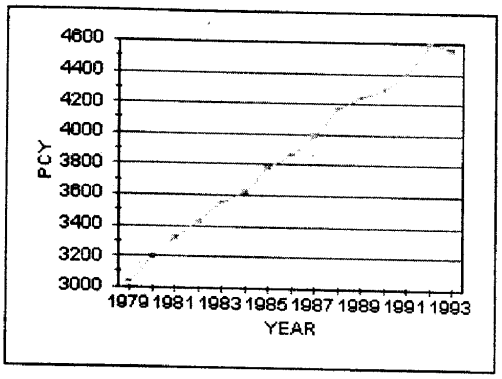
The weight for the level of education and experience is computed using a study on income profile by Shahrukh[1985]. The data set utilized for estimating earning function was generated by the Population, Labor force and Migration survey, a joint project of the Pakistan Institute of Development Economics and ILO-UNFPA.

We have opted for the study done by Shahrukh as it represents entire Pakistan encompassing rural and urban areas and is based on a large survey. It is also assumed that this income profile remains constant. Shahrukh has regressed earning on Age, Age^2, and used Dummy variables for Primary, Secondary, High, Urban, Punjab, Singh, Administration, Clerical, and interaction terms used are Primary & Urban, Secondary & Urban, High & Urban. From the study, we assume that rural employed persons and other than Administrative and clerical profession are representing "agriculture sector", while the "clerical and administration" employed persons are represented as being related to "Other sector" . The remaining is considered as employed in the manufacturing sector.

The percentage distribution of employed persons of 10 years age and above by major industry division, level of education and by age groups are multiplied by total labor force to get employed labor force of 10 years age and above in each industry and by age groups. The labor force is then aggregated using computed weights of education and experience to get weighted sum of the labor force in each industry division in an particular. To see the change in the distribution of labor force each industry's aggregated labor force is divided by the base year(1972) labor force.

The labor force survey is published for the years of 1972, 1975, 1979, 1985, 1988, 1991 and 1992. For the missing years we have interpolated index of labor force using spline technique with 5th Order Lagrange produces fifth-order Lagrange interpolations in which a fifth-order polynomial is fitted through closest six points.

APPENDIX-B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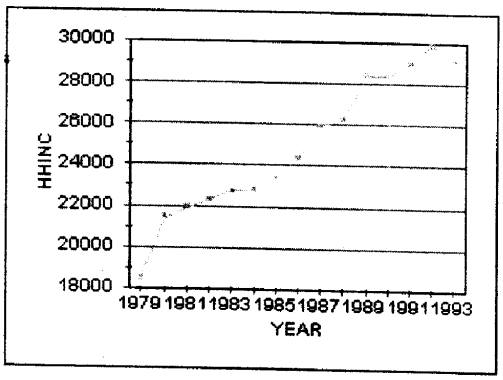
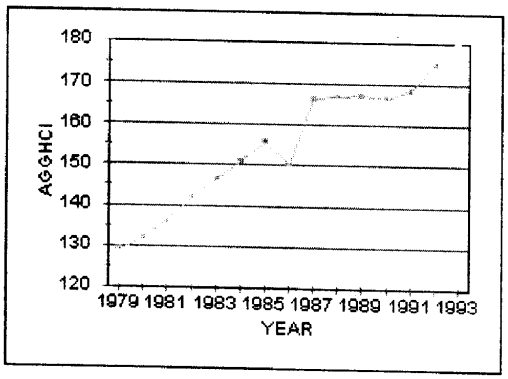
4400
4200
4000
3800
3600
3400
3200
3000
1979 1981 1983 1985 1987 1989 1991 1993
YEAR


HHINC
30000
28000
26000
24000
22000
20000
18000
1979 1981 1983 1985 1987 1989 1991 1993
YEAR


AGGHCI
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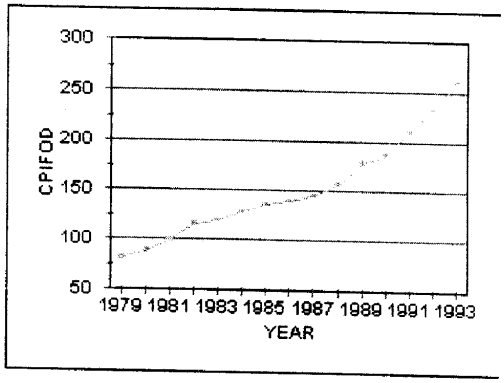
170
160
150
140
130
120
1979 1981 1983 1985 1987 1989 1991 1993
YEAR


CPIFOD
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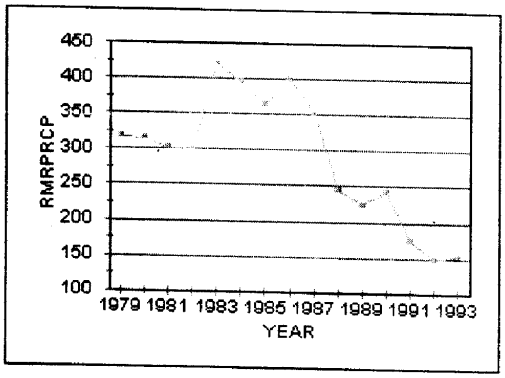
250
200
150
100
50
1979 1981 1983 1985 1987 1989 1991 1993
YEAR


RMRPRCP
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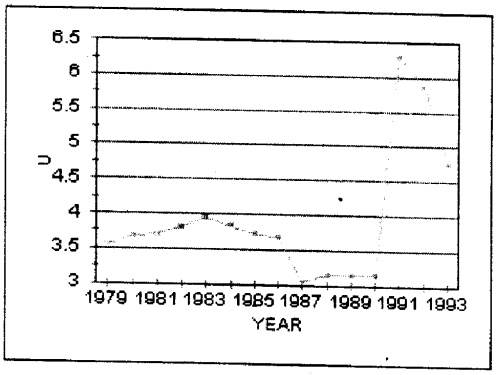
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5.5
5
4.5
4
3.5
3
1979 1981 1983 1985 1987 1989 1991 1993
YEAR

APPENDIX-C

POVERTY BLOCK

S-1 Aggregate Human Capital Index

$$AGGHCI = \left[\frac{HCIA * LA + HCIM * LM - HCIOT * LOT}{LA + LM + LOT}\right]$$

S-2 Per Capita Remittances

$$RMRPRCP^{r} = \left[\frac{RM^{r}}{POP}\right]$$

S-3 Real Household Income (Supply Side)

$$HHINC = \left[\frac{GDP}{POP}\right] * HHSZ$$

S-4 % Population below Poverty Line

$$\begin{aligned} HHLDB = {} & + 67.5006 - 0.0010\ HHINC - 0.1525\ AGGHCI + 0.0380\ CPFOD \\ & (13.44)^{*} \quad (-4.76)^{*} \quad (-2.57)^{**} \quad (2.14)^{***} \\ & - 0.0107\ RMRPRCP + 0.4739\ U - 3.9124\ DUM90 \\ & (-2.55)^{**} \quad (1.68) \quad (-4.28)^{*} \end{aligned}$$

$R^2 = 0.98$

S-5 Price Index for Food

$$\ln CPIFOD = - 0.201 + 1.0461 \ln PI \qquad R^2 = 0.99$$
$$(-3.05)^{*} \quad (79.03)^{*}$$